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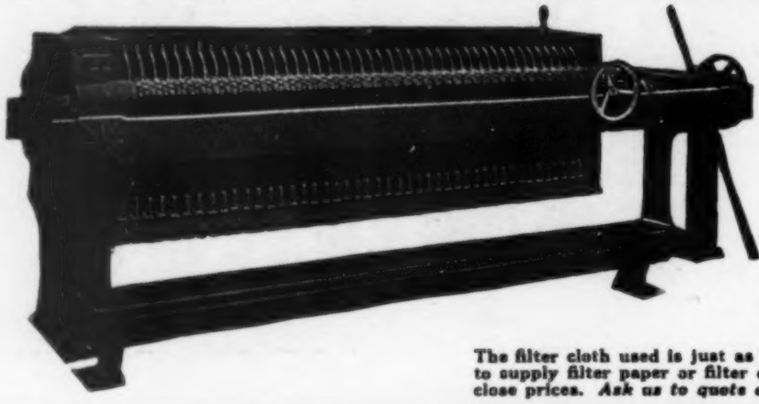

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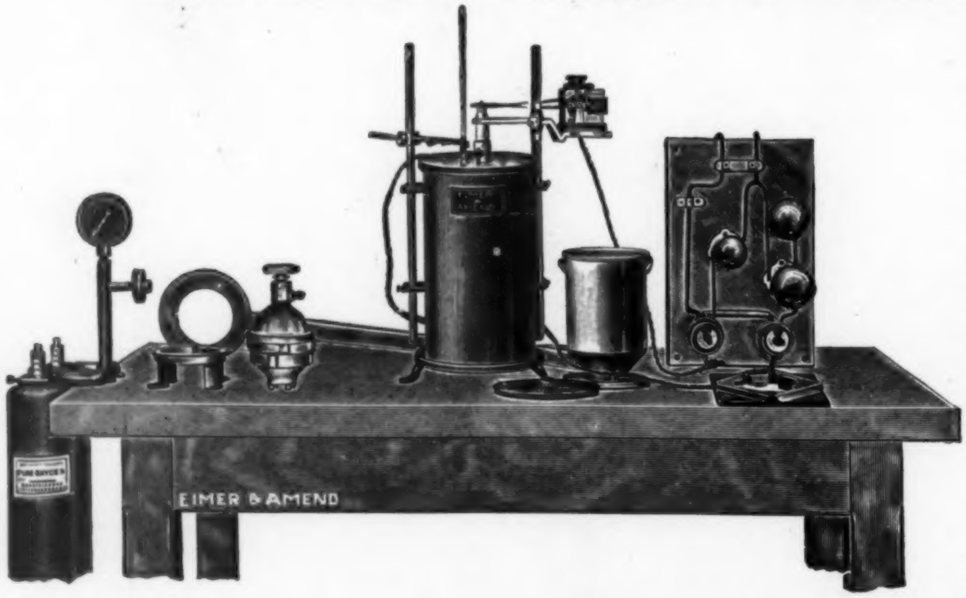

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H. C. PARMELEE, Editor

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Nitrogen Again To the Fore

A THOROUGH technical study of all important phases of the nitrogen industry has long been needed. During the war period and shortly thereafter, the Nitrate Division of the War Department made a significant study of nitrogen sources and possibilities, but this work was limited largely to the military aspects of the case. More recently the Fixed Nitrogen Research Laboratory, now under the auspices of the Department of Agriculture, has studied extensively the technology of nitrogen fixation and the possibilities of utilizing some nitrogenous raw materials such as cyanamide, but here again the problem has been largely that of one user interest—namely, the agricultural demands for inorganic nitrogen. Now fortunately the problem is to be approached from a different angle—the commercial and international aspects of nitrogen supply for all branches of industry.

Secretary HOOVER clearly regards this work as one of the most important phases of the survey of raw materials that was authorized in the closing hours of the last Congress. He rightly indicates that both agricultural and industrial considerations must be studied in order that adequate supplies of fixed nitrogen at reasonable prices may be available in the United States. Such study will, in part at least, answer the question: What are the prospects for a new nitrogen-fixing industry that may be made possible through further technical development of the cyanamide, the Haber, the cyanide and the arc processes? Or more specifically, what price limits must they meet in order to compete commercially?

It is a demonstrated fact that ammonia, nitric acid or any one of the important compounds of these two sources of inorganic nitrogen can be made successfully on a large scale by either the cyanamide or the Haber process. The cyanamide plant at Muscle Shoals was a complete technologic success. The Haber process plant at Syracuse has had most gratifying, and one might even say almost unexpected, success. Several other procedures for nitrogen fixation are equally promising from a technical point of view. But what of their commercial future?

The answer to this question will be determined by several independent factors. One of these factors is the minimum cost at which Chilean nitrate can be delivered in the United States. This, in turn, is fixed by the efficiency of nitrate recovery methods in Chile, by the magnitude of the export tax that Chile places upon nitrates, by ocean freight rates, and possibly even by American tariff protection. Another basic factor in determining the range and the average of inorganic nitrogen market prices will be the extent to which byproduct coke ovens are developed in the United States. Even at high prices for sulphuric acid, the modern coke oven cannot afford to operate without manufacturing ammonia liquor or ammonium sulphate. The ammonia is inevitably produced in the raw gas and in general it must be recovered before this gas is used or sold. The quantity of ammonium sulphate so produced is a factor in determining market tendencies; and at the present time with imposing increases in the byproduct coke-oven industry, this factor assumes enlarged importance.

All of these important influences will be analyzed in the survey contemplated by the Department of Commerce. Nor will this department work alone, for by law its efforts are to be supplemented by co-operation from all of the other branches of the government concerned. There is no question that all these agencies will gladly co-operate in the study, which is of mutual interest and importance.

Both Secretary HOOVER and Dr. KLEIN, director of the Bureau of Foreign and Domestic Commerce, in which the work will be done, appreciate the complexity and the importance of the task before them. However, they look forward with confidence to the result. They are particularly fortunate, too, in having selected for the task a man who knows this industry thoroughly. Dr. HARRY A. CURTIS, who will be in immediate charge of the investigation, has previously served as a captain in the Nitrate Division and as executive officer of the Fixed Nitrogen Research Laboratory of the Department of Agriculture. Thus he is well acquainted with the problems on which the government is equipped to assist. He also knows the situation at Muscle Shoals from extensive personal experience there; and the problems of the coke industry are well known to him through his experience during the past 3 years as a technical executive in that industry.

Every interest affected by the production or the supply of inorganic fixed nitrogen will be concerned in this study. The conclusions reached in it will be of large influence in determining the disposition of the government's properties at Muscle Shoals. They will largely determine the course of further industrial development in the industry during the coming decade, but with the favorable conditions which attend the beginning of this work, all can look forward with confidence and satisfaction. The Department of Commerce will do its work thoroughly. It will produce a well-balanced, constructive and fair report. It will doubtless upset the plans of some of the would-be industrialists who have desired a slice of the Muscle Shoals melon. It may even disturb the plans of some influential politicians. But in the end the results will be good, and industry should stand ready to give every possible assistance to the department, that its results may be achieved with the minimum of effort and the maximum of speed.

Electrochemical Society Honors E. G. Acheson

TO RECORD the award of honorary membership in the American Electrochemical Society to Dr. EDWARD G. ACHESON is a pleasant privilege. These distinctions are worth while, eminently worth while, provided always good judgment prevails. There does not seem to be any method of rewarding the hard work that brings negative results, although many a fine life has been devoted to determining what not to do in the search for nature's secrets. But rewards of honor and distinction to those who reach important goals and who are the mediums of great contributions to human knowledge are none the less proper and worthy. They mark the high spots in achievement, and Dr. ACHESON has reached several of these. All over the world methods of industry have been changed by his far-reaching activities in the study of conditions, in imagination, and in the will power and diligence to put his findings through.

Like a number of other American inventors, he was at one time associated with THOMAS A. EDISON. And like several of these, he also preferred to follow his own leads and to become, so to speak, an institution in himself.

The leads of Dr. ACHESON were practically all within the great domain of electrochemistry. Nearly every month some new use of one or another of the products of his inventions is discovered and the efficiency of manufacture is promoted. Why shouldn't such a benefactor be distinguished? The rewards of research in wealth are sometimes big and much more often they are very slight; but these honors have no bearing upon property. They are, in a way, unworldly; they outlast life and pass the name on into history. The occasion is unknown to the ignorant; the ceremony is modest; there are no great applauding crowds; but to the ear of the imagination there are, at such a time, ghostly trumpets and drums that sound the music of enduring fame.

Transportation And Our Prosperity

THERE may be some division of opinion as to the permanence of our present prosperity, but there can be no dissent from the view that its continuance depends in a large measure on the maintenance of adequate transportation facilities. Therefore, when the Chamber of Commerce of the United States, at its eleventh annual meeting, chose to discuss "Transportation in All Its Phases," it hit upon a theme of primary interest to every branch of business.

Freight rates are a significant item in manufacturing costs, particularly in industries such as ours that supply basic materials for further fabrication. But even more important is the element of delay and the great blight on industry resulting from the periodic shortage of cars and shipping facilities. It has been estimated that due to insufficient transportation during the past year the scarcity of coal alone penalized industry by an amount equivalent to more than half of all the freight charges paid on this commodity. Obstructions in the distribution of finished products may not always be as evident, but they are equally expensive to the ultimate consumer.

Under private management the railroads have made a remarkable comeback. By economies in operation and improved efficiency they have recently been able to handle a larger volume of traffic than ever before in their history. But during this time they have not been free from attack, and there is still the danger that radical legislation and ill-advised regulation will entirely throttle their progress. Pending before Congress at its last session were 134 separate bills designed to regulate the railroads and reduce their net incomes by lowering rates or revising valuations and rates of return. This antagonistic attitude threatens the investing public's confidence in railroad finances at a time when money is sorely needed for new rolling stock and other equipment as well as additional terminal and shipping facilities. It is evident from recent utterings of Senator LA FOLLETTE and other self-termed "progressives" that this campaign of destruction will be continued, and unless the saner representatives of the public vigorously oppose it, great harm will be done to the railroads and, therefore, to industry.

What is really needed is a sound national policy toward transportation that will provide adequately for future expansion, and at the same time properly co-ordinate the interests of both shipper and carrier. Good transportation is the crux of good business conditions and all who are interested in our permanent prosperity should recognize the seriousness of the present situation.

Up to Date In Going Backward

ACCORDING to CHARLES R. GOW, president of the Associated Industries of Massachusetts, taxes in the United States consumed in 1912 6.36 per cent of the nation's production. In 1921 this had increased to 16.7 per cent. That is, whoever worked at a gainful occupation, even if he worked 365 days in the year, spent 61 days to earn his proportionate share of taxes.

Before the war we used to consume 76 per cent of our production, leaving 24 per cent for taxes and new enterprises. If we consumed the same proportion last year—and we do not seem to have grown more provident since the war—we had left for taxes and new enterprises about $12,500,000,000. Of this sum, taxes took, roughly, about $8,500,000,000, leaving $4,000,000,000 for development. It is estimated that about $6,000,000,000 is needed to meet the reasonable expansion of our industries and the facilities to meet normal growth, so that we are as a nation about $2,000,000,000 short of our annual needs for legitimate progress.

Every dollar spent in public expenditures must be earned by somebody before it can be collected in taxes, so that, according to Mr. GOW, in order to get ahead we must produce more, spend less in taxes, or reduce the standards of living.

A large part of our taxes is for war debts, which, as Secretary WEEKS points out, are not properly to be considered as current military expenditures. No matter how peace loving we may be, we can't dodge debts. To be sure, there is great waste in the national budget, but there is also great neglect. We believe, however, that a careful analysis of government expenditures would show that, despite our preposterous Indian Bureau with its 5,000 to 6,000 clerks, the log-rolling river and harbor bills and bonuses and all sorts of easy-going munificences with public moneys there are works which should be undertaken and completed that would inhibit

even an ideal government from reducing expenses in any great measure. The change should be from useless outlays to useful ones.

Again, the old notion that money spent for luxuries and high living is kept in circulation and thus enriches somebody, no matter who he may be, will not go down any more. That is like paying men to carry stones from one field into another, and then to carry them back from the second field to the first. The men have earned a living and supported their families by the proceeds of their work, but there is no advancement in the process. We're not getting ahead by it. It is wealth consumed but not invested.

The only real way to meet the threat which Mr. Gow's figures represent is to save the pennies; to spend less than we earn and to put the money aside; to live modestly, to follow the homely advice of old BEN FRANKLIN. The most foolish ambition on earth is the desire to be up to date when we are going backward.

Changing Our Datum Points

UNITS of measurement and datum points are prime considerations to the technical man. They are fundamental in attacking any problem, and until they are settled definitely and precisely there can be no record of progress. Perhaps it is because HERBERT HOOVER is addicted to the engineer's methods of thinking that in his address last week before the Chamber of Commerce of the United States he felt the necessity for calling attention to our present methods of gaging business. "We must get our minds away from the notion that pre-war standards of living and volume of business are normal now." And, he added, "We must not be frightened when our output of steel, or textiles, or automobiles, or lumber, or corn, or our car loadings mount to figures far in excess of those that would be implied alone in a normal growth of population."

It was this necessity for changing our datum points that President BARNES of the National Chamber also stressed in a recent talk to the Merchants' Association of New York. The decade 1913-1922 witnessed tremendous expansion in business, he pointed out, due in no small measure to progress in science and invention, to labor-saving devices and other improvements in production processes, and to better management and administration. Briefest reference to business statistics shows how marked has been this change. From 1913 to 1922 our population increased from 95,000,000 to 110,000,000 and our annual income from $33,000,000,000 to $50,000,000,000. Savings almost doubled and national bank balances jumped from $6,000,000,000 to $16,000,000,000. But this growth in men and money was not without increased production efficiency and greater economy of human effort. Per capita earnings rose from $200 in 1890 to $600 in 1920 and the volume of factory production increased 95 per cent between the census years 1900 and 1920. But this progress is most striking when measured in terms of individual effort. From the metal industries, for example, we learn that pig iron production per worker in 1889 was 267 tons, and in 1919 it was 709 tons. In 1909 the output of automobiles amounted to 1.6 cars per person employed in the industry. By 1919 this had increased to 4.1 cars, while the capital investment per car had been lowered from $1,400 to $1,100.

Secretary HOOVER characterized the accomplishments of this decade in a single sentence: "A rough estimate would show that we could supply each person in the United States with the same amount of commodities he consumed 10 years ago and lay off 2,000,000 people from work." Fortunately, however, consumption and distribution have in general kept pace with production, so that this tremendous increment in output is marketed and consumed with but little apparent difficulty.

Perhaps some of our oldest industries have approached very near to saturation, but there is another great group that is only at the beginning of its development. In this category are many of our chemical and chemical engineering industries. Their growth can no more be measured in terms of 1913 production than can their future expansion be gaged on the basis of present performance. Who can say, for instance, what will be the saturation point for synthetic resins, or pyroxylin lacquers, or a special alloy, or some new food product? It is apparent that the time has come for us to change our datum points and to measure business progress on the basis of individual initiative and enterprise.

Ice Cream That Will Not Melt

IT IS not infrequent in our office to receive a call from a dignified, successful man in the, let us say, ice cream business. He has a scientific goal. He wants to produce ice cream that will not melt. No, really, we are not joking. Of course it is our duty to point out the fact that since the melting point of ice cream is considerably below room temperature, his desideratum is impossible.

If we did it in just that way, however, he would mistrust us and leave the office in the firm conviction that we would probably steal the idea or that science was bunkum. Actually we do suggest, for example, that unless considerable cornstarch is used the ice cream will melt out of shape but that with cornstarch or some other similar substance the ice cream would probably hold its shape even after it had melted. Of course it would no longer be ice cream and probably wouldn't taste very good, but perhaps it might be worth while getting someone to work on the problem.

So we get his royal ear, so to speak, and then we sow some real propaganda. Naturally, we say, the technical man you get to work on this job may not ever get non-melting ice cream, but he will solve a lot of other problems for you quite incidentally. For example, the corrosion of ice cream containers is a big expense; he may be able to help you there. This is bound up with the kind of salt you use in freezing. In addition there are raw materials and flavorings that have both an economic and a commercial side. On the one hand these should be cheap and on the other they must give a desirable product. On all these problems the technical man can work, and his work will be a positive benefit and a constructive factor. Thus non-meltable ice cream may become the minor end rather than the main problem.

And not infrequently we have been able to urge the business man to try out technical help. True, no ice cream manufacturer has come to us, but some men with ideas equally as foolish as non-meltable ice cream have come and seen and been persuaded. It is one of the ways of doing our bit for progress and humanity and the technical men.

Readers' Views and Comments

An Open Forum for Subscribers

The editors invite discussion of articles and editorials in *Chem. & Met.* or on other topics of pertinent interest

Manufacture Of Chromium Steel

To the Editor of Chemical & Metallurgical Engineering

SIR:—A recent issue of *Revue de Métallurgie* contains a digest of an article by F. T. Sisco appearing in *Chemical & Metallurgical Engineering* for Jan. 11, 1922 (vol. 26, p. 71). In this article, entitled "The Manufacture of Chromium Ball-Bearing Steel in the Heroult Furnace," the author states: "The manufacture of electric high-carbon chromium ball-bearing steel has until recently been accompanied by the difficulty of producing a product which is free from surface seams and internal hair lines. This statement should not be construed to mean that no good ball steel is as yet made in the electric furnace. There are many manufacturers that are producing an excellent steel for this purpose, but the fact is they are not doing it consistently."

Your readers will doubtless be interested in learning that we have been making important quantities of ball-bearing steels by my system at Ugine, Savoy, at the "Forges & Aciéries Electriques P. Girod" since 1912. During the war production of this analysis was at the rate of 6,000 tons per year, and for many years our plant has supplied practically the entire needs of French ball-bearing manufacturers. That this electric-furnace steel is not the least inferior to the best Swedish steels is proved by many tests—among them I may cite those made under the auspices of Hoffman, the distinguished technical administrator of the Compagnie d'Applications Mécaniques, and published in the official *Bulletin* of the Chambre Syndicale des Constructeurs d'Automobiles for July, 1922.

Fifteen bars were studied, three of each of the following analyses:

	C	Mn	Si	S	P	Cr
Swedish steel	0.97	0.30	0.30	0.01	0.03	1.49
Girod steel	1.03	0.24	0.17	0.02	0.02	1.19
Electric steel "C"	1.01	0.31	0.24	0.02	0.01	1.22
Electric steel "W"	1.03	0.17	0.29	0.01	0.01	1.58
Electric steel "K"	1.02	0.30	0.21	0.01	0.01	1.17

These bars were annealed to Brinell hardness of 200, making sure that their microstructure was comparable. Tension tests gave very uniform results, when individual samples are compared, indicating great uniformity in the bars. The test pieces show a pronounced neck, a very slight cup and cone fracture, and fine grain. Results follow:

	Elastic Limit	Ultimate Strength*	Elongation	Contraction
Swedish steel	99,100	183,000	39	24
Girod steel	104,800	183,000	44	24
Steel "C"	104,000	173,000	46	24
Steel "W"	110,000	185,000	41	23
Steel "K"	104,000	187,000	46	23

* Figured on area at neck.

For testing in static flexure, pieces were machined 10x10x120 mm., heated for 5 minutes at 790 deg. C. in a salt bath, quenched in water, and gradually drawn back, reaching 180 deg. C. in 10 minutes. The pieces were tested on knife edges, 100 mm. apart, loaded centrally, and all broke with an excessively fine and silky grain. Breaking loads are as follows:

Swedish steel	1,550 kg.	1,500 kg
Girod steel	1,500 kg.	1,500 kg.
Steel "C"	1,700 kg.	1,600 kg.
Steel "W"	1,550 kg.	1,600 kg.
Steel "K"	1,750 kg.	

Thus no sensible differences can be noticed for these test samples, whether made by Swedish crucible process or by at least two styles of electric furnaces.

To make this steel, we at Ugine have always used a fusion with complete oxidation and without excessive temperature (which would produce suroxidation of the iron—a condition very difficult to correct), followed by a deoxidation stage at a temperature as low as is consistent with maintaining a fluid slag. Mr. Sisco recommends that in a Heroult furnace it is best to melt with only partial oxidation and deoxidize on a very hot bath. We have found that partial oxidation gives variable steel unless the raw materials are of very good quality and of uniform composition, whereas a consistently fine quality of steel may be made of rather variable raw materials if melted with complete oxidation. Our practice is followed not only for high-chromium carbon steel but also for other special steels, especially for armor-piercing shells.

From 20 years' experience with alloy steels, I have concluded that the faults found in electric steel are not due to chemical combinations, but most often to a high pouring temperature. Notably in chromium-nickel steel this results in abnormal crystallization, which is extremely difficult to break up and refine, even by very careful reheating. PAUL GIROD.

Cannes, France.

The Resolution of Petroleum Emulsions

To the Editor of Chemical & Metallurgical Engineering

SIR:—In an article appearing in your journal[1] some time ago, Harold V. Dodd, writing on "The Resolution of Petroleum Emulsions," stated that the presence of asphalt is assumed to be the reason for the emulsion in crude petroleum oils. He also explained a number of elaborate measurements for combating the action of this asphalt.

If the asphalt is the interfering substance, why not remove it? The writer took a sample of Texas crude which had been in emulsion for about 10 years and on breaking the emulsion found it contained more than 50 per cent water. The resultant oil showed no emulsion by the centrifugal test.

These results were obtained by filtration, using infusorial earth as a filter-aid to hold back the colloidal carbon and asphalt.

I should be glad to hear of anyone who has had similar experience. E. H. WILLIAMS.

Chicago, Ill.

[1]*Chem. & Met.*, vol. 28, No. 6, pp. 249-53, Feb. 7, 1923.

British Chemical Industries

From Our London Correspondent

London, April 18, 1923.

PRICES of chemical commodities are still firm, and this may be ascribed mainly to the situation in the Ruhr, competition from Germany being so small that it can almost be left out of account, although small stocks from Hamburg and Antwerp are still being offered. The fact is that production costs of British manufacturers are now in many cases below those on the continent, and with America consuming the bulk of her own production, there is likely to be considerable activity in British chemical industries during the next few months, a fact that is reflected to some extent by the recent remarkable rise in prices of chemical companies' stocks and shares. The budget introduced into the House of Commons 2 days ago, including as it did the 50 per cent reduction of the corporation tax on limited companies, together with the immediate prospect of a further reduction in railway rates, has not been without effect on the chemical trade.

Industrial and General Developments

Speculation is rife as to the reason for the recent considerable appreciation in the shares of the British Cellulose Co., and important announcements are expected next month in regard to the production of acetyl cellulose silk and also in regard to the activities of Nobel industries. The subject of nitrogen fixation is again coming to the fore, and the breezy discourses of E. Kilburn Scott, whose activities in America are probably familiar to readers of *Chem. & Met.*, are very opportune, because public and governmental opinion in regard to empire nitrogen fixation has become somnolent and apathetic. There has been a tendency to assume that Brunner Mond and synthetic ammonia will have it all their own way and are too strong for others, but there can be no doubt that, at any rate in outlying parts of the empire, the arc and also the Häusser process will find application, while the latter can also be usefully developed alongside synthetic ammonia or cyanamide plants.

The increased use of decolorizing carbons has brought forth the usual crop of "new" processes, and there is certainly more competition at the present time in these products. It seems extraordinary that so little appears to be understood about the physical chemistry and constitution of these materials, which are only too often manufactured in a most unscientific and haphazard manner and without regard to economy or scientific control. This also applies to compound mixtures of decolorizing carbons with infusorial and other earths, and generally speaking the literature and information on the subject seem very deficient. Some interest has been aroused recently by the use of decolorizing carbons for medicinal purposes, and this presents a promising field for further investigation.

Further progress is reported in the various processes that are being developed by the Thermal Industrial & Chemical Research Co. in regard to the use of a bath of molten lead for the heat-treatment of various materials, particularly in cases where it is desired to reduce the time of treatment or reaction to a minimum. This company is a subsidiary of Woodall, Duckham & Jones and the pioneer work is being done by J. S. Morgan, who recently read a paper before the Coke Oven Managers' Association describing the application of the process to the low-temperature carbonization of shale and the like. It was stated that with a time of passage through the lead of less than 15 seconds, a lead bath 3 ft. 6 in. by 1 ft. 3 in. by 6 in. would treat 5 tons of material per day. A number of patents have been taken out for the treatment of other substances, and the same firm has also taken a hand in the barium carbonate process of nitrogen fixation, for which success has been claimed at the works of the British Cyanides Co.

The Departmental Committee on the Industrial Use of Lead and Leadless Paints has now reported against their abolition and considers that the chief danger has been the dry rubbing down of old paint, which should be adequately overcome by precautions directed toward wetting during rubbing down. This would merely involve the use of waterproof sandpapers and the matter is to be further considered by a technical commission to work in co-operation with the Department of Scientific and Industrial Research.

Combustion Myth to Be Settled

To establish or refute the general impression that salt or salt solutions, when sprinkled over fuel, have a beneficial effect, the Minister of Interior and Mines of Canada instructed the Dominion Fuel Board to undertake a series of experiments. From time to time liquids and powder have been placed on the market and extensively advertised, with the claim that they had the property of producing greater heat when applied to raw coal or to unburned cinders. In many of these preparations salt formed the basis, consequently the result of the experiments with this material are exceedingly valuable.

The tests were conducted under conditions identical to those which ordinarily apply in domestic heating furnaces, and, as completed, clearly demonstrate that salt, when sprinkled over fuel, has no beneficial effect, unless it be that the soot produced in combustion is packed down in the stove or furnace pipes.

The experiments were conducted at the Fuel Testing Station of the Mines Branch, where further tests on other materials which are claimed to have a beneficial effect upon fuel are being carried out.

Insecticide and Fungicide Symposium

Some recent developments in the use of insecticides and fungicides were brought out during the meeting of the American Chemical Society at New Haven. A symposium on the subject was conducted by the Division of Agricultural and Food Chemistry.

Analysis of the light and of the heavy white arsenic samples that show peculiar differences are explained partly by the different solubilities resulting from different sized crystals. The idea was set forth that this difference in size of crystals at least partly controlled the different results in use of this material as an insecticide. Addition of small amounts of lime influence the solubility of arsenic in the form of lead arsenate.

Bordeaux mixture is improved by the addition of a small amount of casein to one of the constituents of the mixture, when these two are put up in separate containers for dry storage. A mixture of 2 parts of copper sulphate to 1 part of lime is recommended.

The Chlorine Industry in the United States

An Economic Analysis of This Vitally Important Industry Shows That the Situation Is Serious With No Relief in Sight—This Article Presents the Data and Offers a Solution

By Paul S. Brallier

The past 2 years has been a very trying time for the chlorine manufacturer. The fact that the same statement may be made of practically every other industrial division brings little comfort and no relief; for the troubles of the chlorine industry are the direct result of an extraordinary war expansion. The purpose of the following discussion is to present as accurate a picture of present conditions in the industry as available data will permit, and to suggest a means of overcoming the difficulties that are only too evident.

To begin with, the chlorine industry includes a great deal more than the preparation of chlorine by electrolyzing a salt brine in a suitably designed cell. The byproduct caustic liquor must be evaporated, and its salt content separated before caustic soda is ready for market; and the chlorine gas must be compressed and liquefied, or be combined with other reagents, before it is ready for sale. Thus the chlorine manufacturer must not only prepare the chlorine, but must absorb it as well, and his present problem can be stated very briefly as one of finding a suitable absorbent. For the purpose of this paper, the chlorine industry includes only those producers who market chlorine or its direct products.

A Few Notes on Size, Extent and Growth

As an indication of the size and importance of the chlorine industry, Bureau of Census figures for 1919 indicate a total annual tonnage of the various products, including caustic soda, of approximately 212,000 tons, with an aggregate value of about $16,000,000. This compares with a total valuation of $694,000,000 for all chemicals produced during the year. Chlorine and chlorine products have become necessities in a wide variety of industries and processes. They are indispensable in the paper industry; are finding increasing application in metallurgy; are widely used in general chemical and dye manufacture, and in the preparation of medicinal chemicals; are generally conceded to be most effective in sanitation and in water purification; have been applied to the refining of oils, and have played a most important rôle in warfare. The chlorine industry is therefore an essential industry, and any factors affecting its welfare are matters of general concern to industry as a whole.

The installed capacity for chlorine production in the United States is about 372 tons per day. This includes only the chlorine that is made for sale as chlorine or its direct products, and does not include chlorine made and used in the same plant, nor the chlorine capacity of the government plant at Edgewood Arsenal. Table I shows how this capacity is distributed among the various types of cell now in use.

The installed capacity is computed on the assumption that all cells installed are working at full load all the time. The actual continuous working capacity may be taken as approximately 300 tons per day. On this basis, and assuming that all the chlorine was made by the electrolysis of sodium chloride, the caustic soda produced by plants marketing chlorine and chlorine products during 1918 when all available chlorine capacity was being utilized would be 24 per cent of the total caustic production. The census figures for 1919 indicate 28.5 per cent of the total caustic soda production as electrolytic; but this includes caustic produced in plants consuming their own chlorine, so that 24 per cent seems to be a fair figure. A survey of the caustic soda manufacturing capacity of the country made by the War Department in 1917 showed that 20.6 per cent of the total capacity was electrolytic. Taking this lower ratio for the years 1914 to 1917 inclusive, and the higher for 1918 to 1922, the average daily chlorine production calculated from published data on caustic soda production is as shown in Table II. These figures are considered sufficiently broad to include the chlorine produced in the manufacture of caustic potash.

Going a step farther, and using the data of the census of chemical industries, the distribution of the chlorine produced among the various chlorine products has been tabulated in Table III.

These capacity, production and distribution data are presented with some misgivings, since they are for

TABLE I—INSTALLED CAPACITY OF VARIOUS CHLORINE CELLS

Cell	Tons Per Day	Cell	Tons Per Day
Nelson	79	Gibbs	64
Allen-Moore	55	Billiter-Siemens	31
Townsend	60	Wheeler	10
Castner	63	All others	10
			372

TABLE II—AVERAGE CHLORINE PRODUCTION IN THE UNITED STATES

Year	Tons Per Day	Per Cent of Working Capacity
1914	102	...
1915	144	...
1916	196	...
1917	244	...
1918	300	100
1919	180	61
1920	220	74
1921	133	45

TABLE III—CONSUMPTION OF CHLORINE AND CHLORINE PRODUCTS

Product	Tons Per Day		Tons Chlorine		Per Cent of Total	
	1919	1921	1919	1921	1919	1921
Bleaching powder	198	165	69	58	38.5	43.6
Liquid chlorine	47	49	47	49	26.1	36.8
Carbon tetrachloride	13	7	13	7	7.2	5.3
Chloroform	2.3	1.2	5	2.5	2.8	1.9
Tin chlorides	12.3	?	5	?	2.8	?
Aluminum chloride	11.7	11.7	10	10	5.6	7.5
Sulphur chlorides	3.2	?	2	?	1.1	?
Hydrochloric acid, Antimony chloride, Chlor benzols, Benzaldehyde, Benzoic acid, Chlor acetic acids, All others			29	6.5	15.9	5.2

the most part indirect. Installed capacity data for the Nelson and Allen-Moore cells were supplied by H. R. Nelson and by Kent R. Fox, of the Electron Chemical Co., respectively, and the figures for the Townsend cell have been published by A. H. Hooker in a paper read before the American Institute of Chemical Engineers. Installed capacities for the Billiter, Castner and Gibbs cells were figured from the percentages given in the government survey of caustic soda production in 1917, using the Hooker capacity as the basis of comparison. In the case of the actual daily chlorine production from 1914 to 1922, the applying of a flat percentage of total caustic soda production may be questionable; but the reticence of the chlorine fraternity prevents obtaining more reliable information.

Even with the above limitations in mind, however, the data given indicate a serious excess chlorine-producing capacity. The normal consuming capacity seems to be about 180 tons per day; and the remaining 120 tons working capacity represents a large capital investment that must necessarily lie idle, and that places an abnormal overhead charge against the actual production. Still more important is the fact that this excess capacity induces such keen competition among the various members of the industry that prices reach a level where amortization and depreciation charges are slighted, and expansion and development work curtailed, so that the future of the industry is endangered. A manufacturer should receive such a price for his products as to allow him a reasonable margin above his actual operating costs for replacement of capital invested, for obsolescence of equipment and for improvement, extension and expansion in whatever line of production he may be engaged. The buyer may profit temporarily by a lower price; but he will lose eventually in the failure of his source of supply. Healthy competition and friendly rivalry among various members of an industry are essential to the growth of that industry; but warfare is as much a destructive agency in business as in international relations.

Probable Development in the Chlorine Industry

Development in the chlorine industry will come under the two general heads of improvement of present apparatus and processes, and extension of the uses of chlorine and its compounds. Apparatus and process improvement would naturally be concerned first of all in reducing the cost of manufacture of chlorine gas. The principal items which the chlorine manufacturer buys are salt, fuel, power and labor; and local conditions at the various plants determine their relative importance. Salt and fuel efficiencies are purely individual plant problems; but all manufacturers would be interested in modification of cell design so as to raise the power efficiency and lower maintenance charges. The average chlorine cell shows an energy efficiency of approximately 60 per cent. The remaining is lost as heat, due principally to the internal resistance of the cell, which in turn is a function of current density. The recently described Marsh cell claims a higher efficiency due to lower current density brought about by the use of grooved anodes and corrugated cathodes designed to give increased electrode surface for the same over-all dimensions. The principal maintenance charges on cells are caused by graphite anode disintegration, and, with the exception of the Castner cell, by diaphragm stoppage. A study of these factors might very well be co-operative.

The second point of attack under process and apparatus improvement would be in the manufacture of chlorine products. Referring to the table of chlorine product distribution, it will be seen that bleaching powder is by far the biggest item. The data, of course, are for 1919 and 1921; and present conditions might show a larger percentage to liquid chlorine and a smaller percentage to bleach. Even so, bleaching powder is unquestionably the largest single chlorine consumer. While its manufacture dates from 1799, it is only within the past 15 or 20 years that any decided effort has been made to improve the method of manufacture. Practically all the bleaching powder made in this country today is made in "chambers," although mechanical bleach chlorinators have been used in Germany for some time. In the chamber process, hydrated lime of definite moisture content is spread in a layer about 4 in. thick over the floor of a room 15 to 20 ft. wide, 40 to 100 ft. long, and 5½ to 6½ ft. high. In the floor are imbedded cooling coils through which water is circulated in cold weather, and refrigerated brine in hot weather. Dilute chlorine gas is led into the chamber and is absorbed by the lime. When the lime has been saturated, the chamber is cleared of chlorine, and workmen enter and scrape the finished powder to outlets in the floor, through which it drops into the can-loading apparatus.

The spreading of the lime and the collecting of the bleaching powder are disagreeable jobs, and labor is consequently inefficient and expensive. A recent bleaching powder installation made by the Belle Alkali Co. and described in this journal[1] has utilized modern conveying systems to handle the lime to the chambers and the finished powder from them; but the most disagreeable part of the work, the collection of the powder, must still be done by hand. To get away from this high labor cost, one large company is said to be scrapping its present chambers and installing German mechanical chlorinators, which consist of a tier of nearly horizontal cylinders either rotating or with rotating paddles. The lime passes successively from one cylinder to the one immediately below, and chlorine is fed into the lowest cylinder and passes up through the system in counter-current to the lime. Another proposal that seems feasible is made by J. W. Moore in U. S. Patent 1,272,880 (1918), which covers the use of a rotary kiln not much less than 80 ft. long through which hydrated lime and chlorine are passed in counter-current. These mechanical chlorinators may be expected to replace the chambers quite generally if bleaching powder continues to be made in large quantities.

Liquid Chlorine a Growing Product

With development in the art of chlorine liquefaction and transportation, however, and increased experience on the part of consumers in handling the liquid, chlorine in this form is very likely to replace bleaching powder. Bleaching powder is not an ideal product even aside from its present method of manufacture; for it is disagreeable for the consumer to handle, is subject to considerable variation in chlorine content and in dissolving and settling properties, and deteriorates, especially in warm weather, so that it can be stored for only a limited length of time. By buying lime and liquid chlorine, the consumer may readily make his own bleach liquor by absorbing the chlorine in a

[1] Vol. 26, No. 22, p. 1038, May 31, 1922.

milk of lime of suitable strength. He is thus assured of his bleach supply with a decided saving in handling charges, as well as a more nearly uniform quality of bleach.

The various processes of chlorine liquefaction now used or proposed—pump, tower, and absorption—differ only in the means of getting the chlorine under pressure. In the pump process, the problem of lubrication was a serious one, since chlorine acted on lubricating oils. This was overcome by Knietsch in 1888 by the use of a sulphuric acid piston in a U-shaped compartment. Within the past 10 years a French pump has been developed that has a metal piston lubricated with sulphuric acid. This French machine has been tried out in this country during the past year and has been found to be very satisfactory in operation, and to have a capacity many times that of the German pump. Its initial cost is low and maintenance charges are small.

In the tower system, chlorine is drawn into a descending column of sulphuric acid through a modified injector, and the tower is made high enough so that the weight of the column of acid is sufficient to compress the gas for liquefaction in refrigerated condensers.

The absorption system parallels the ammonia absorption system very closely. The chlorine is dissolved from a more or less dilute gas by some suitable solvent. Goldschmidt patented the use of tin tetrachloride, and more recently C. T. Henderson has proposed the use of carbon tetrachloride. To obtain concentrated solutions, the solvent must be refrigerated. By heating the concentrated solution, the chlorine is driven off periodically and condensed, the necessary pressure being generated by the evolution of chlorine.

The pump and tower processes are the only ones in use in this country at the present time, and neither seems to have any great advantage over the other. Liquid chlorine can scarcely be expected to be a low-priced material, since the cost of liquefaction averages around $15 per ton, and the charge for containers, including inspection, valve repair and replacement, and return on capital invested is considerable, especially on the smaller sizes. During the war 1-ton and 15-ton containers were developed and have been in use for the past 4 years with uniformly good results. Where chlorine is required in sufficient quantities, these containers should prove much more satisfactory to the consumer and be much less expensive to the producer than the smaller "bottles."

Liquid chlorine is used at the present time quite extensively for water purification. This market is limited, however; for if the entire urban population of the United States were supplied with 130 gal. per capita per day of water treated with 2 lb. chlorine per million gallons, the chlorine consumption would be only 7 tons per day. Liquid chlorine is also used in the "aging" or bleaching of flour, the average dosage being given as 150 lb. chlorine per million pounds flour. Here again, if all the flour consumed in the United States were chlorine-treated, the daily chlorine requirement would be only about 6 tons. The high degree of purity and the convenience of liquid chlorine make it a desirable product in many other applications; but the consuming capacity is evidently covered by present production if contract price quotations are any index.

With one exception, the remaining chlorine products listed in the consumption table offer very little hope of expansion in volume of demand. A price war in carbon tetrachloride is on at the present time, and so far as low prices are concerned there is every inducement for the development of new uses for it. Chloroform is likely to be limited to pharmacal and very special solvent use, since for most solvent and extraction work it can be replaced by the less expensive carbon tetrachloride. Tin chlorides are expensive materials due to the high price of tin, and their use is limited to the silk and dye industries. Hydrochloric acid manufacture from hydrogen and chlorine is constantly competing with the salt-sulphuric acid process, so that while the volume consumed, equivalent in 1921 to 80 tons per day of chlorine, is quite satisfactory, the chlorine manufacturer can scarcely afford to take more than a limited percentage of the business. The war-time demand for monochlorbenzol and sulphur chlorides led to the installation of producing capacity far beyond peace-time requirements, so that conditions have been favorable for an expansion in their use for the past 4 years, with no evidence of any such development.

What is to be done to remedy the situation? The law of natural selection may be allowed to take its course, and the industry be stabilized by a process of elimination. This would result in a capacity not greatly in excess of our present consumption, and in the loss of millions of dollars of invested capital. On the other hand, the chlorine manufacturers of the country may get together on a program of research and education, and build up the consuming capacity to the present producing capacity or even farther. The first is a passive destructive solution; the second, active and constructive; and the chlorine producers must decide which course shall be followed, and must be responsible for the results of that decision. The saying, "He profits most who serves best" applies with equal force to industries and to individuals.

Aluminum chloride is the one hopeful item in the list. Its effectiveness in increasing gasoline yields in oil distilling has been demonstrated, and unless prohibitive royalties on the basic patents of the process interfere, the demand for anhydrous aluminum chloride is almost certain to increase as oil supplies decrease and the price of gasoline goes up. If only 10 per cent of the average daily gasoline production for the first 9 months of 1922 had been produced by aluminum chloride cracking, and if 50 per cent of the aluminum chloride had been recovered and re-used, the demand for fresh chloride would have exceeded 300 tons per day. Each ton of aluminum chloride requires in its manufacture something over 1,600 lb. of chlorine.

Up to a short time ago anhydrous aluminum chloride was produced altogether by the action of chlorine on metallic aluminum. The metal has been used in the form of pigs and clippings, but principally in the form of a dross collected in the Hall process of aluminum manufacture and containing 25 to 35 per cent metallic aluminum. Even the dross, however, has been an expensive source of metal, and a more extended use of the chloride has been prevented by its high cost. Numerous patents have been granted for various modifications of the general process of chlorinating a mixture of

bauxite and carbon, but it is only recently that the largest producer of the chloride has shifted from dross to bauxite as a source of aluminum. There are many factors that make this chlorination a difficult one to handle on a large scale, but the biggest single problem is the matter of supplying heat to maintain the bauxite-carbon mixture at the proper temperature, and at the same time introducing chlorine.

New Uses for Chlorine

The possible extension of the uses of chlorine and chlorine products has been very thoroughly discussed by V. R. Kokatnur in a paper presented before the American Electrochemical Society in 1918; and it would serve no useful purpose to review that discussion here. It may be said, however, that since the publication of that paper a chlorination process has been developed and successfully applied to the recovery of nickel and cobalt from arsenical ores; and it is entirely possible that other metallurgical uses may be found for chlorine, particularly if a type of furnace that can be heated in the presence of chlorine is developed. Another application that is interesting is the recent Henderson-Haggard process for killing offensive odors by injection of chlorine into the odorous gases. Chlorine has also been successfully applied to the production of pure cellulose from woody fibers; and while chlorine so used would displace a percentage of the bleaching powder now consumed in the paper industry, adoption of this process would mean an increase in chlorine consumption. Chlorine in the form of bleaching powder has recently been found a very satisfactory sweetening agent in gasoline refining.

The situation in the chlorine industry of the United States, then, is that with a producing capacity of about 300 tons per day, the normal consuming capacity seems to be less than 200 tons per day. Four years of unrestricted competition with all its attendant virtues has failed to increase to any great extent the demand for chlorine or chlorine products. Even assuming that present producers can continue to operate under prevailing conditions, the consumer must be paying a premium over and above the actual cost of the products he buys to take care of the overhead charges on this excess capacity. If consuming capacity can be increased, both producer and consumer will gain by the increased stability of the industry. The failure of the competitive period to bring about any marked increase in consumption of chlorine indicates that the problem is too big for individual producers to solve. It requires the co-operative effort of the whole industry.

Co-operation of Consumer and Producer Needed

This co-operation could take the form of the collection and publication of reliable production statistics for the industry. It could consist of the outlining and carrying out of a definite and comprehensive research program, to replace the present system of development, by individual producers, of the same products, which is wasteful in its duplication of effort, if for no other reason. It could take the form of a systematic education of industry as a whole in the use of present chlorine products, and such new products or uses as may be found. All three of these functions, the gathering of statistics, the carrying on of research, and of education, are beyond the capacity of the individual company. They are vital to the industry, and should be promoted and maintained by the industry.

This idea of co-operation is, of course, not new. In fact none of the ideas presented in this article have any claim to originality. All these things have been suggested and talked about before—and nothing has been done. The purpose throughout this discussion has been to present the facts again, fortified with such figures as were available, in the hope that, if the argument is repeated often enough, something will be done.

Arsenic Trichloride Affects Industrial Workers

Extensive laboratory research and factory investigations have shown that the local caustic action of arsenic trichloride and the absorption of the poison through the skin or through the lungs frequently result in death or serious disability. The current *Monthly Labor Review* of the U. S. Department of Labor describes these investigations, points out the effect of the poison when encountered in various ways, and also suggests a few precautions that may be taken to preserve the health of workers in industrial plants where the compound is manufactured.

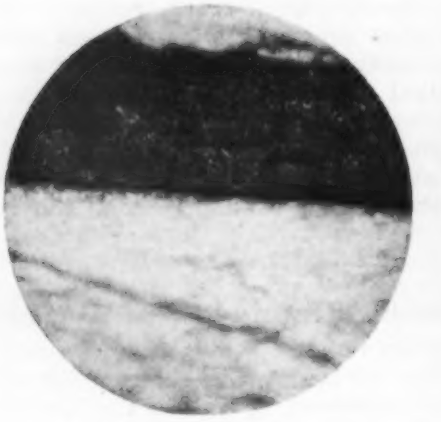
Applied to the skin, arsenic trichloride kills the tissues very rapidly, the action being somewhat retarded by washing the part affected within one minute. In this case, however, the final result is not affected. Within a few hours after such application arsenic can be recovered from most of the tissues and organs of the body. Inhalation of 1 part of arsenic trichloride to 40,000 parts of air kills mice within 5 minutes.

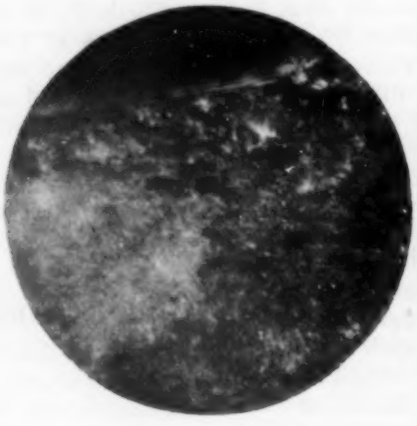
The compound is very diffusible and enters readily into various combinations, forming visible particles where the air contains moisture. Vapors are quite likely to be invisible when the air is unsaturated. Experiments show that the atmosphere throughout the vicinity of apparatus in which arsenic trichloride is manufactured contains considerable amounts of the poison. Special ventilating arrangements are required to remove the fumes that arise when this compound is necessarily exposed to the air in filling drums and sampling their contents. Air containing fumes so removed can be purified by a fine water spray before being discharged into the atmosphere. Persons employed in this industry should wear impervious clothing, and only experience can show whether they should not also wear suitable gas masks.

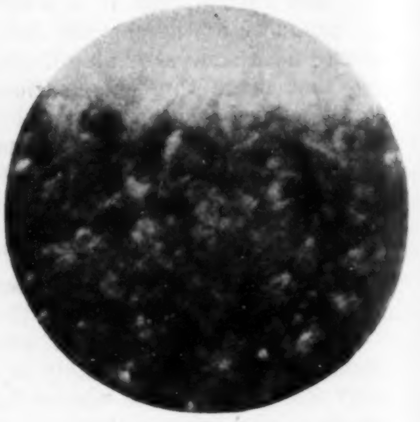
Selenium Oxychloride Cleans Cylinders

Paint, japan or varnish may readily be removed by a treatment with the solvent selenium oxychloride, which was discovered by Prof. Victor Lenher of the chemistry department of the University of Wisconsin. Rubber, both pure and vulcanized, and resinous and glue binder substances, including the natural resins, glues, gelatins, celluloid, varnish, lacquer and paints, are soluble when treated with selenium oxychloride.

This solvent may also be used advantageously for the removal of carbon from the cylinders of gas engines. Such deposits usually consist of particles of carbon, more or less cemented together with hydrocarbons, such as partly carbonized oils or deposits from oils, including gasoline. Selenium oxychloride, alone or compounded with other substances, will sufficiently dissolve the binder constituents of the carbonized mass to cause the disintegration of them and the cleansing of the cylinders.







FIGS. 1 TO 3

Fig. 1—Mag. 160. Thickness 0.0047 in., or 0.1193 mm. This paint was allowed to stand for 2 weeks, during which time the material became noticeably more viscous. This was used in preparing a three-coat film from which Figs. 2 and 3 were photographed. In these the drying was more rapid. No separation of the oil and pigment could be noticed.

Fig. 2—Mag. 250. Thickness 0.0072 in., or 0.1828 mm.

Fig. 3—Mag. 440. Thickness 0.0072 in., or 0.1828 mm.

Microstructure of Paint Films

An Attempt to Determine Relation Between Microstructure and Protective Value of Certain Paints and Pigments

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Department of Chemistry, Iowa State College, Ames Ia.

THE use of photomicrography in examining paint films is relatively recent. Toch[1] photographed the surfaces of freshly applied red lead paint and recorded a separation of the oil from the pigment. Coye,[2] in making a study of the protective value of various paints on structural steel, prepared photomicrographs from the surfaces of the weathered test pieces after 1 and 2 years' exposure. Photomicrographs of cross-sections of paint films have been prepared by Gardner. In one[3] he shows the cross-section of a barytes paint film in which three layers or coats are easily distinguishable. In another[4] is shown a lateral view of a white enamel on oilcloth. This latter paper shows also, at relatively low magnification, the surface effect of too rapid drying of paint by evaporation of the volatile constituents, as well as the appearance of needle scratches on brittle and elastic varnishes.

The purpose of this work is to examine, at both high and low magnifications, cross-sections of some of the common paint films, and to determine if possible a relation between the microstructure and protective value.

How Films Were Prepared

The films were prepared by painting on smooth tinfoil laid over glass. After the drying of this and additional coats, the tinfoil-paint film was taken up from the glass and cut into strips for convenience in handling. The strips were placed, as suggested by Gardner,[3] on the surface of mercury contained in a porcelain vessel. The tin amalgam formed dissolved in the excess of mercury, leaving the paint film clean except for traces of amalgam which were removed on a dry towel.

A piece of the film about 2 cm. square was pressed between two blocks of plastic, medium melting paraffine and allowed to set. It was found advisable to trim away the ragged edges and dip the block in melted paraffine. After this protection, the block was dipped quickly into cool water, so as to harden the surface only, leaving the inner portion relatively less rigid. This prevented a breaking away of the paraffine from the paint film and insured a smooth, uniform surface when sectioned by means of a microtome.

The paint used for the red lead films was prepared from commercial boiled linseed oil and commercial red lead (85.22 per cent Pb_3O_4, 0.28 per cent insoluble matter, 14.50 per cent PbO by difference) approximately at the rate of 25 lb. of the pigment to 1 gal. of oil, which is a proportion widely used in practice. The white lead films were made from commercial boiled linseed oil and Dutch Boy white lead.

A photomicrograph of a three-coat film of red lead paint is shown in Fig. 1. Each coat was applied immediately after mixing. From the fact that the surfaces of the lead oxide particles reflect light better than the surrounding oxidized oil in the dry paint film, it is possible to determine the distribution of the pigment particles in the various coats. It is evident from the photomicrograph that a partial separation of the pigment has taken place.

Red Lead Priming

It is a well-known fact that red lead paint undergoes a marked change on standing. The red lead oxide,

Fig. 4—Mag. 56. Thickness normal film, 0.0089 in., or 0.2260 mm.; ridge, 0.0145 in., or 0.3683 mm.

[1] "Chemistry and Technology of Paints," 2d Edition, page 58.
[2] Bulletin 54, Eng. Exp. Station, Ames, Ia.
[3] "Paint Technology and Tests," p. 88.
[4] Circular 110, Paint Manufacturers' Assoc. of America.

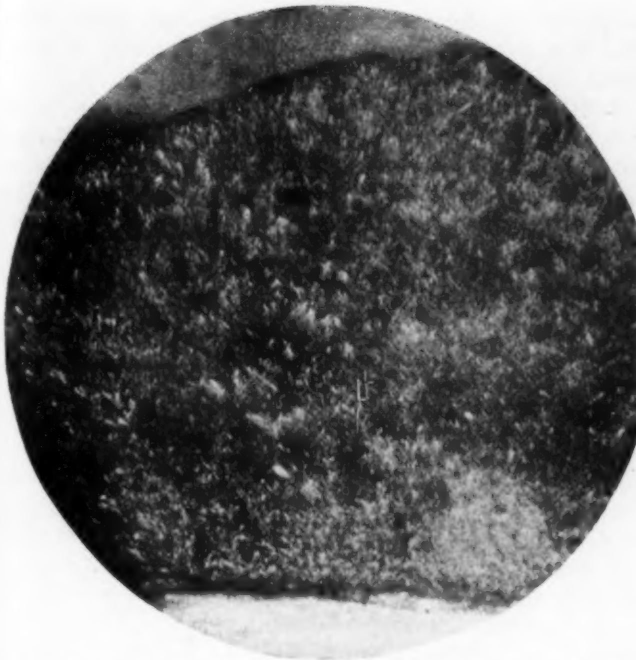


Fig. 5—Mag. 200. Thickness ridge, 0.0145 in., or 0.3683 mm.

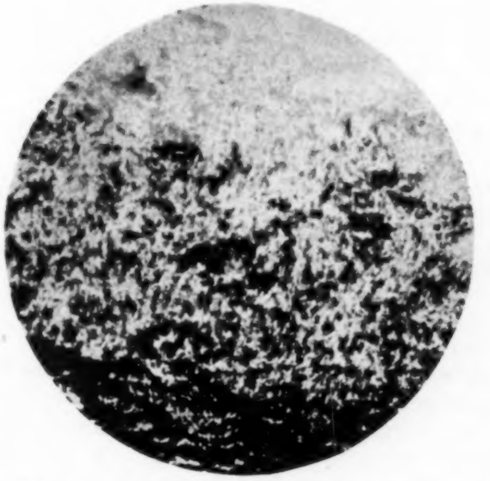


Fig. 6—Mag. 300. Thickness red lead two coats, 0.0039 in., or 0.1001 mm.; sublimed blue lead one coat, 0.0023 in., or 0.0584 mm.

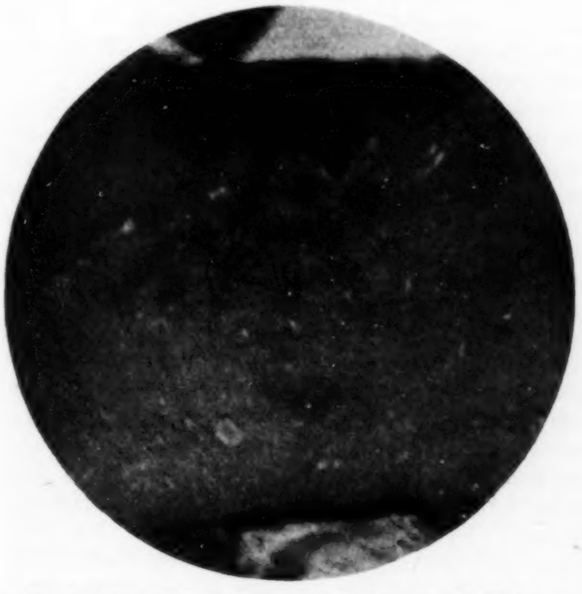


Fig. 7—Mag. 380. Thickness 0.0065 in., or 0.1671 mm.

Pb_3O_4, is slightly soluble in linseed oil, especially if the latter has a moderate or high acid number. The lead monoxide, PbO, having a lower valence, is less acid or may be said to be more basic than Pb_3O_4 and hence is more readily acted upon by an oil of a given acid number than is the higher oxide.

The so-called red leads of commerce vary in composition from less than 75 per cent of Pb_3O_4 to more than 99 per cent, the remainder being largely PbO. The latter oxide will dissolve in the oil to a greater or less degree depending upon the temperature of the system and the relative subdivision of the two oxides. The drying of the paint, promoted by the catalytic effect of lead compounds in the oil, allows less time for the heavier particles to settle out. A more uniformly distributed pigment results.

The marked increase in viscosity due to the interaction of the oil and pigment is often objectionable. In the painting of structural steel it is quite common for the men to complain of great fatigue in the arms, particularly when paste red lead is used, and there is a tendency to flow the material on quite thickly. These thick layers dry in wrinkled, non-uniform films, which are thought to give uncertain protection. Cross-section slides of these ridges were prepared and photographed.

In Fig. 4 may be seen the relative depth of the ridge as compared to the normal film.

A more highly magnified view of the ridge is shown in Fig. 5, where it is apparent that, even with this collection of excess material, the pigment particles are well distributed.

Under conditions of use and exposure these ridges are objectionable for the reason that they collect dust and present an unsightly appearance. It is common practice on steel bridges to use one coat of red lead and follow with a smooth drying paint that covers well, such as sublimed lead or sublimed blue lead. A cross-section of such a film is shown in Fig. 6. In this instance there was used one coat of sublimed blue lead over two coats of red lead. The upper surface of the red lead, which forms the line of contact between the red and blue paint, is irregular, due to the uneven application of the former and the too vigorous drying that followed. The final coat of sublimed lead dried to a smooth and glossy surface, making the retention of dust or moisture less probable.

In the microscopic study of paint films it is often desirable to determine the number of paint coats in a given film. Gardner[3] photographed a section of a three-coat barytes film and was able to point out three distinct layers. Efforts to duplicate Gardner's results with white lead paint in this laboratory were unsuccessful. The separate coats could not be distinguished at 350 diameters magnification. It was thought probable by the writer that barytes, being a more inert material, would separate out in strata and present a microscopic appearance unlike a typical lead or lead zinc paint.

Use of Stains

A three-coat film of white lead paint was made and a cross-section was photographed as soon as the film was dry enough. The pigment particles were apparently dispersed throughout the film as shown in Fig. 7. A section of the same film was stained with alcoholic gentian violet and photographed with results as shown in Fig. 8. The latter picture, although quite unsatisfactory from a photographic standpoint, suggested the

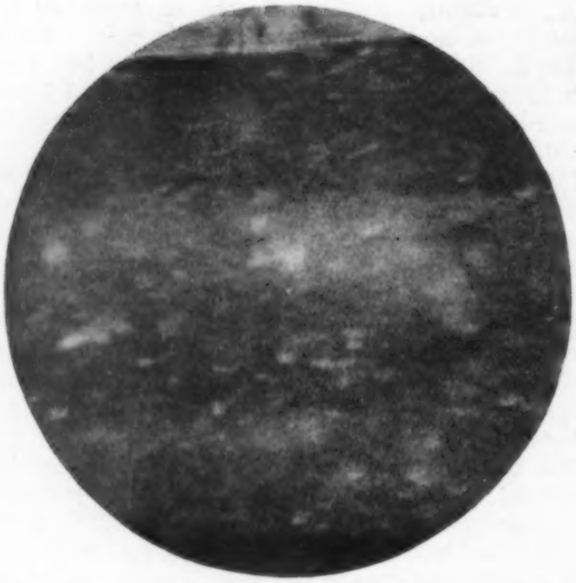


Fig. 8—Mag. 380. Thickness 0.0065 in., or 0.1671 mm.

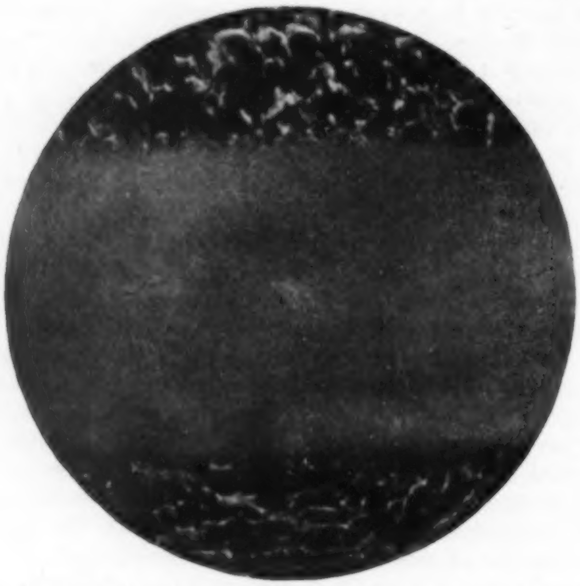


Fig. 9—Mag. 350. Thickness 0.00514 in., or 0.1305 mm.

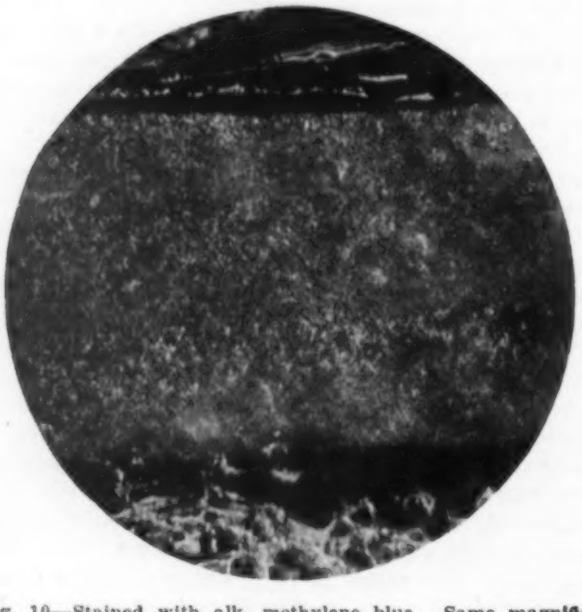


Fig. 10—Stained with alk. methylene blue. Same magnifications and dimensions as in Fig. 9.

possibility of determining the number of paint coats in a film by dyeing, provided a stain capable of more detail be employed.

Another white lead film prepared from the same material and in the same manner, but at a different time, was allowed to dry for about 75 days. Fig. 9 shows a section of this film not stained, while Fig. 10 shows the appearance after staining with alkaline methylene blue. The following stains were used in attempts to find one best adapted to paint films: gentian violet, malachite green, acid fuchsine, methyl violet, neutral methylene blue and methylene blue made slightly alkaline with sodium carbonate. The latter reagent was found to be uniformly satisfactory.

Summary

In summary, it may be said that photomicrographs of cross-sections of red lead paint films show a setting of the red lead pigment particles in the freshly prepared and applied paint, and the well-distributed pigment particles where the prepared commercial red lead paint has been allowed to stand. Further, it has been found possible to determine the number of paint coats in a white or tinted paint by staining a section of the film with mildly alkaline methylene blue. This method of paint investigation by staining, as here outlined, is believed by the writer to be new.

This work was done in the division of physical chemistry and metallography of the Department of Chemistry, Iowa State College, which is under the direction of Dr. Anson Hayes, to whom the writer is indebted for his criticism of the present paper.

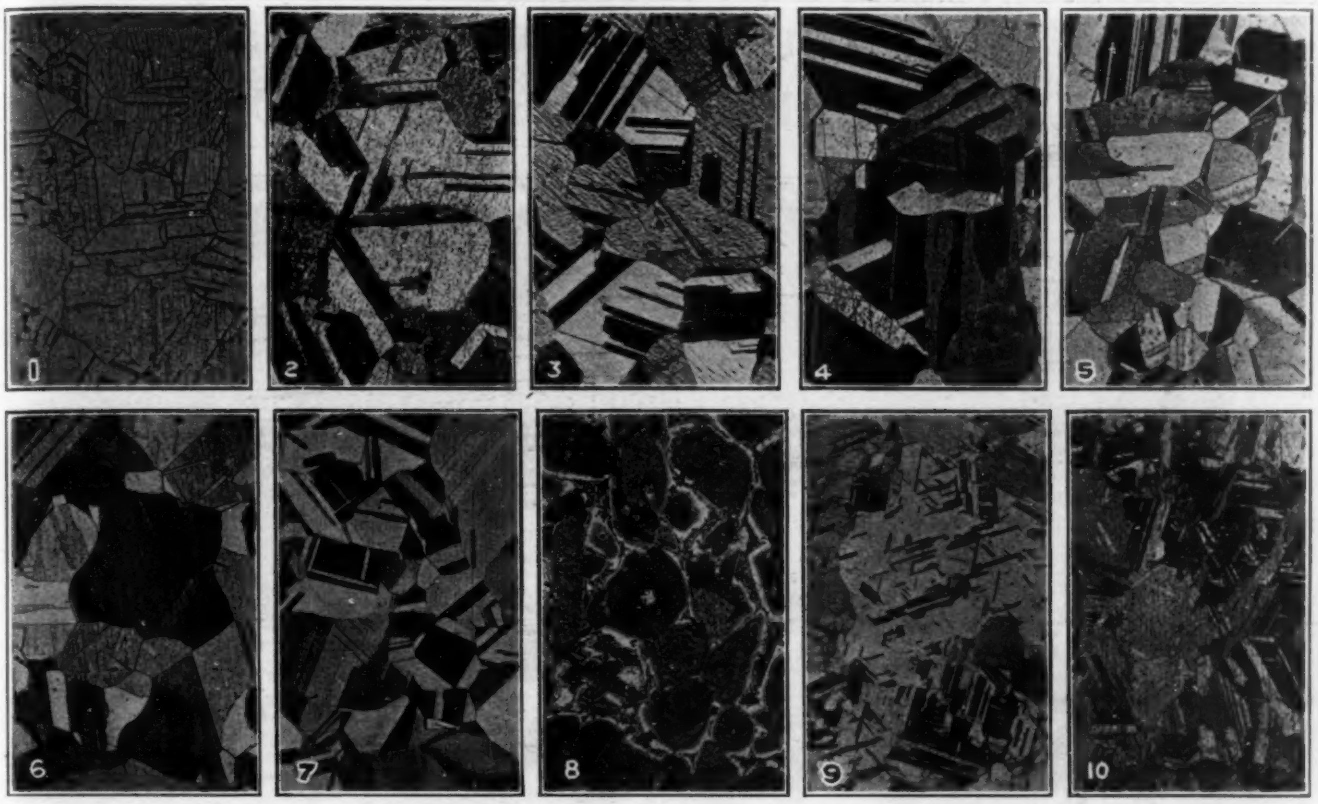
Etching Aluminum Bronze

By Jerome Strauss
Chief Chemist, U. S. Naval Gun Factory

In Scientific Paper 435 of the U. S. Bureau of Standards attention was called to the generally unsatisfactory results obtained in etching rolled aluminum bronze. The usual reagents for developing the microstructure of copper-base alloys had been tried, together with several new combinations, but with rather indifferent results. The present author has been working for several years with various aluminum bronzes and after many unsuccessful attempts has developed a method which, though far from perfect, may still be of some value to those who may use these metals.

Binary alloys of copper and aluminum containing 4 to 8 per cent of aluminum, though relatively strong, possess very low elastic limits, are very soft and extremely ductile; in fact, by suitable methods of preparation, alloys may be had that will show close to 100 per cent elongation on the standard 2-in. gage length specimen. These properties undoubtedly bear a close relation to the polishing characteristics of the metals. It is very difficult, when finishing with the usual grades of levigated alumina, completely to avoid scratches on the polished surface; this is particularly true when minute oxide particles frequently found in these alloys are present. Magnesia, as recommended by Rosenhain for aluminum alloys, to some extent avoids these troubles and at the same time produces a superior surface after etching.

No single etching reagent has been found that will serve even for all the commercial aluminum bronzes. But in the early work, various mixtures of nitric and



FIGS. 1 TO 10—ALUMINUM BRONZES. × 100

Fig. 1—Alloy 283, HF and Reagent B. Fig. 2—Alloy 283, HF and Reagent A, magnesia not used in polishing. Fig. 3—Alloy 283, HF and Reagent A, polished with magnesia. Fig. 4—Alloy 283, HF and Reagent C. Fig. 5—Alloy 283, HF and Reagent D. Fig. 6—Alloy 283, HF and Reagent E. Fig. 7—Alloy 283, HF and Reagent F. Fig. 8—Alloy 4981, HF and Reagent B. Fig. 9—Alloy 8086, Reagent D only. Fig. 10—Alloy 8086, Reagent A only.

chromic acids seemed to give greatest promise and were carefully studied. Ferric chloride solutions yielded fair results with alloys containing a duplex structure, but failed to show some features of the microstructure and in alloys containing over about 3.5 per cent iron it not only dissolved out the third constituent but destroyed its characteristic outlines by the time the general structure had been developed. But all of these reagents leave surfaces which are more or less stained, producing some patches showing a fairly well-defined structure and others with no structure whatever. The behavior was such as strongly to indicate the presence of a protective film, and to destroy this hydrofluoric acid was tried and found suitable. Too great concentration or too long an etching period are harmful, the adopted practice being to immerse the specimen in 10 per cent HF in water for 2 to 5 seconds to remove the film, wash in cold water and quickly transfer to the desired etching solution. Various alkaline solutions have been tried to replace the HF without satisfactory results.

The photographs that are reproduced herewith were obtained with the following alloys and solutions:

Alloys No.	Al	Fe	Cu	Condition
283	6.65	0.13	93.32	0.40 sheet-annealed
8086	6.96	1.21	91.86	0.20 sheet-annealed
4981	8.79	3.69	87.53	..... sand cast

Reagents:

A	50 cc.	HNO_3;	20 gm.	H_2CrO_4;	30 cc.	H_2O
B	5 cc.	HNO_3;	20 gm.	H_2CrO_4;	75 cc.	H_2O
C	10 gm.	$FeCl_3$;	30 cc.	HCl;	120 cc.	H_2O
D	30 cc.	HNO_3;	70 cc.	H_2O;		
E	10 cc.	NH_4OH;	5 cc.	H_2O_2:		
F	NH_4OH + stream of O_2					

Reagent B develops only the grain boundaries of the 7 per cent aluminum alloy; variations in color or depth of shadow with changes in orientation are absent (Fig. 1). Improvement produced by the use of magnesia as a final polishing agent is readily observed by comparing Figs. 2 and 3. The use of ammonia water (sp.gr. 0.90) through which a flow of oxygen is maintained, as used by Rawdon and Lorenz at the Bureau of Standards, gives the excellent results shown in Fig. 7, but it required a period of 30 minutes to produce this condition. Occasionally specimens may be found which without the use of HF will etch in spots sufficiently well to give fair photographs; the grains, however, are not as clear or as sharply defined as when HF is employed (Figs. 9 and 10).

Fig. 8 shows a sample of aluminum bronze containing a high percentage of iron as well as sufficient aluminum to produce the beta solution. Some reagents may develop single features of this structure, but here are clearly observable the coring of the alpha, the details of the beta, an indication of what are most probably twins in the alpha and the third constituent due to the iron sharply outlined. The latter is found as nodular particles varying in color after etching from blue-gray to dark brown, thus accounting for the light and dark ones appearing in this illustration.

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Correction

On page 635 of the April 9 issue of *Chem. & Met.* an article appeared giving figures on aluminum production for 1922. The facts published were abstracted from the United States Geological Survey Bulletin. We wish to take this opportunity of acknowledging the source of this material, credit for which was inadvertently omitted in the published article.

EDITORIAL STAFF REPORT

THE forty-third general meeting of the American Electrochemical Society was held at the Hotel Commodore, New York City, May 3, 4 and 5, 1923. The meeting was unusually well-attended, due largely to the very attractive program. The technical papers time and again drew forth animated and valuable discussions. Of particular interest was the session on Electrode Potentials, Thursday morning, and that on the Rare Metals, Saturday morning. The local committee under the very able guidance of its chairman, Irving Fellner, had arranged for a number of social functions that added greatly to the enjoyment and delight of the meeting.

ELECTRODE POTENTIALS

The Thursday morning session was devoted to papers on Electrode Potentials and was in charge of Dr. W. G. Horsch. Prof. Hugh S. Taylor of Princeton presented the first paper, "The Newer Aspects of Ionization Problems." He referred to the work of Born, Fajans, Haber and others on the problem of energy changes accompanying the conversion of some solid crystalline substances and of the hydrogen halides into dissolved ions. In calculating the individual value of the heat of hydration of the hydrogen gas ion, it was apparent that the calculation involved the magnitude of the heat change associated with the electron emission from the metal used as the hydrogen gas electrode. It is well worthy of experimental investigation how or whether the characteristics of the hydrogen electrode change as a consequence of the alteration of the metal used as electrode material. Platinum as electrode has been carefully investigated and tantalum is to be tried next.

In discussing Professor Taylor's paper Dr. S. C. Lind of the Bureau of Mines, Washington, called attention to the fact that we do not know positively whether the chlorine gas ion is identical with the chlorine ion of an aqueous solution. Perhaps with the aid of our newer physical conceptions and our improved methods of investigation this point might be established. Prof. John Johnston of Yale agreed that the ionic theory of 25 years ago was not satisfactory in accounting for many of the newer experimental findings and phenomena observed in electrochemistry. For example, we have no satisfactory explanation for the hydration of ions. Dr. William C. Moore of the U. S. Industrial Alcohol Co. Research Laboratory, referring to the remark by Dr. Lind that sodium ion as gas would according to the Lewis-Langmuir theory be expected to be inert, stated that he had found in his investigation of the flaming arc that the potassium of KCl vapor carried three positive charges. It is possible, however, that the number of charges varies with the temperature, as Wilson had suggested.

H. C. Howard of Princeton University reported briefly on his studies of the "Oxygen Overvoltage of Artificial Magnetite in Chlorate Solution." He found that the oxygen overvoltage of magnetite is much lower than that of smooth platinum. Although it is possible to oxidize chlorates to perchlorates at a platinum electrode, the reaction does not take place if magnetite is used instead. This affords a further confirmation of the hypothesis that there is a direct relationship between the overvoltage of an electrode and its oxidizing or reducing power.

Mr. Howard's paper was discussed by Dr. Max Knobel of the Massachusetts Institute of Technology. He was of the opinion that Howard's conclusions are too general. Dr. Colin Fink of Columbia commented on the great importance of the overvoltage factor in the insoluble anode research. He had found repeatedly that

alloys fairly soluble under ordinary conditions could be made to serve as insoluble anode alloys providing a good adherent film was developed which would catalyze the formation and evolution of oxygen gas.

"The Effect of Current Density on Overvoltage" was the title of a paper presented by Dr. M. Knobel covering an investigation that he, together with P. Caplan and M. Eiseman, had carried out. Electrodes of a large variety of metals and alloys were tried out in acid, alkali and salt solutions. In the case of the hydrogen overvoltages it was found that the current density-overvoltage curves, although of a logarithmic nature, cannot be translated into any simple logarithmic equation. Metals generally specified as having a high overvoltage, as Pb, Hg, Cd, rise sharply to a high overvoltage at low current densities and then increase but little with increasing current density. Metals such as Cu, usually reputed as having a "low" overvoltage, show a more gradual increase of overvoltage with current density, but in general, with the exception Pt and Au, finally attain as high an overvoltage as "high overvoltage" metals. Platinized platinum maintains its low overvoltage even at the highest current densities. Even at 1,400 amp. per sq.ft. the overvoltage was but 0.05 volt.

In the discussion Dr. Carl Hering of Philadelphia referred to experiments made with an iron electrode. The current density was increased to a point when arcing through the gas film took place and eventually the iron electrode was melted under the solution.

N. Howell Furman of Princeton submitted his findings on "Electrotitration With the Aid of the Air Electrode." He has found that the "oxygen electrode-calomel electrode" cell may be used to construct titration curves that are in large measure analogous to those obtained in the familiar hydrogen electrode titrations. Satisfactory results were obtained both in absence and presence of oxidizing agents such as chromates.

Commenting on Mr. Furman's investigation, O. C. Ralston of the Pacific Station, Bureau of Mines, stated that the station had been using the air electrode for some time and had found it very satisfactory in following the purification of inorganic salts such as copper sulphate or zinc sulphate. In the case of a solution of copper sulphate plus ferrous sulphate, as soon as you come to the point when most of the ferric salt is hydrolyzed, a distinct kink in the voltage curve is noticeable. For this purpose the air electrode has been more reliable than the hydrogen electrode; and straight chemical methods are very unsatisfactory. In the case of the elimination of iron from aluminum sulphate and following up the purification, the air electrode has been an indispensable piece of apparatus.

THE START OF A GOOD SLICE

HOOKER ON THE FIRST TEE

An exceptionally interesting paper was that by Prof. A. H. W. Aten of the department of chemistry, University of Amsterdam, Holland. Professor Aten found that when a hydrogen electrode, saturated with hydrogen, is in equilibrium with 0.1 *N* HCl, it is in the same state of equilibrium with 1.0 *N* HCl, and *vice versa*. This is not the case, however, when the solution of an alkali is used in place of an acid. When a hydrogen electrode in equilibrium with 1.0 *N* NaOH is put in 0.1 *N* NaOH, or the reverse, a considerable time period is required to reach a new equilibrium. The same phenomenon is observed in a more marked degree when the electrode is changed from 0.1 *N* NaOH to 0.1 *N* HCl, or the reverse. The explanation suggested is that the electrode must absorb Na or give it off, as the case may be, in order to reach an equilibrium with the final solution.

Professor Aten's paper was discussed at length by Dr. Horsch of the Chile Exploration Co. and by Dr. William Blum of the Bureau of Standards.

"The Reactions of the Lead Storage Battery" were investigated by Dr. Max Knobel, and he reported that his experiments are in entire accord with the theory advanced by Gladstone and Tribe which may be represented by the equation:

$$Pb + PbO_2 + 2H_2SO_4 = 2PbSO_4 + 2H_2O$$

The theory of Fèry based on the assumption that Pb_2O_3 or Pb_2O_5 is formed appears untenable.

J. R. Brossman of the Pittsfield Works, General Electric Co., pointed out the difficulties he had encountered in trying to separate the different lead oxides. Mrs. Helen Gillette Weir of the National Carbon Co., referring to her own investigations on the lead battery, took exception to a number of the statements made by Dr. Knobel, in particular in regard to his finding less than the theoretical amount of acid. Mrs. Weir stated that under ideal conditions very close to the theoretical amount of acid is consumed.

The concluding paper of the session was that by Dr. Alexander Lowy and H. S. Frank of the University of Pittsburgh. They had investigated the "Electrolytic and Chemical Chlorination of Benzene" and found that it is possible to chlorinate benzene by stirring it in with aqueous HCl and electrolyzing. Aqueous NaCl can also be used.

The yield of chlorbenzene increases with increase of

temperature up to 60 deg. C. and is affected by the rate of stirring. The introduction of iodine as a carrier increases the yield. The amount of higher chlorinated products formed increases in general with rise in temperature. The amount of benzene decomposed to CO_2 by anodic oxidation increases with the temperature. Increase in current density rapidly increases the alkali-insoluble product. Water acts as a carrier in the chemical chlorination of benzene. No substitution takes place when dry chlorine is passed into dry benzene. However, chlorine forms addition products of the type of benzene hexachloride.

FELLNER, GIVEN, ROTH AND MOORE IN GOOD COMPANY

Luncheon at McGraw-Hill Co.

Three large buses conveyed the members from the Commodore Hotel to the plant of the McGraw-Hill Co., Inc., where a complimentary buffet luncheon was served, and then the members were conducted through the various departments of the printing and publishing plant. The society enjoyed the visit very much indeed and few members realized the tremendous amount of detail involved in the publishing of a technical paper such as *Chem & Met.* At the conclusion of the inspection trip animated moving pictures were shown depicting the construction and operation of the Diesel engine.

Annual Business Meeting

The first part of the Thursday afternoon session was devoted to the various society reports covering the past year. The report of the secretary showed that since the last spring meeting four volumes of the society had been published, bringing the entire printing up to date. On the basis of the report of the tellers of election the officers of the society for the year 1923-1924 are as follows: President, A. T. Hinckley, Niagara Falls, N. Y.; past president, C. G. Schluederberg; vice-presidents, H. C. Parmelee, A. H. Hooker, W. S. Landis, L. Addicks, G. K. Elliott, Henry Howard; managers, Carl Hering, J. V. N. Dorr, F. A. J. FitzGerald, W. M. Corse, William Blum, F. M. Becket, C. B. Gibson, R. A. Witherspoon; treasurer, F. A. Lidbury; secretary, Colin G. Fink, Columbia University, New York.

The Electrodeposition Division elected the following officers: Chairman, S. Skowronski, Perth Amboy, N. J.; vice-chairman, Charles A. Mann; secretary-treasurer, William Blum, Bureau of Standards, Washington, D. C.; members at large, L. Addicks, F. C. Mathers, M. R. Thompson and F. R. Pyne.

The Electrothermic Division's new officers are: Chairman, G. K. Elliott, Cincinnati, Ohio; vice-chairman, Dorsey A. Lyon; secretary-treasurer, Acheson Smith, Niagara Falls; members at large, F. M. Becket, Bradley Stoughton, J. H. Parker and W. J. Priestley.

GIBSON AND PRESIDENT SCHLUEDERBERG

Interesting reports were submitted by the committee on dry cells, committee on radioactivity, committee on organic electrochemistry, and others.

E. G. Acheson Made Honorary Member

Immediately following the business meeting, President Schluederberg announced the election of Dr. Edward G. Acheson to honorary membership of the society. The announcement was received with great enthusiasm and sustained applause. Mr. F. A. J. FitzGerald in fitting terms outlined the remarkable career of Dr. Acheson, commenting on his many discoveries and inventions which have made him world famous. President Schluederberg presented Dr. Acheson with the illuminated certificate of honorary membership. In accepting it Dr. Acheson spoke briefly of the early days of the society and of the men who made America the foremost country in electrochemistry.

The retiring president, Dr. C. G. Schluederberg, delivered a very inspiring address on "Opportunities of the American Electrochemist Abroad." He had been very fortunate in studying conditions at close range, having during the past year spent 4 months in the South American republics and another 4 months in Asia. We expect to publish this address in full in an early issue of *Chem. & Met.*

Electrodeposition of Metals

William Blum and H. S. Rawdon made a study of the "Influence of the Base Metal on the Structure of Electrodeposits" and reported at the session on Electrodeposition upon the results obtained. The meeting was presided over by G. B. Hogaboom. Blum and Rawdon had found that if copper is deposited electrolytically upon cast or rolled copper which has been cleaned with alkali, the structure of the base metal does not apparently affect that of the electrodeposit. If, however, the surface of the base metal had also been treated with nitric acid, the electrodeposited copper possesses both the crystal form and orientation of the base metal. A series of microphotographs showed the effect very strikingly.

In the discussion of the paper Charles H. Eldridge, research metallurgist, Metropolitan Museum of Art, suggested that a practical application of the influence of the structure of the base metal might be made in electro-refining of copper, zinc, etc., by the proper selection of starting sheet material. It would seem possible to control thus readily the coarseness of crystal structure of the deposited metal. Dr. A. Kenneth Graham of the

University of Pennsylvania drew a distinction between the structure of a deposit which is an exact reproduction of the structure of the base metal and the structure of the deposit which is a direct continuation in growth of the crystals of the base metal. Dr. W. D. Richardson of the Westinghouse Lamp Co. mentioned that he had observed distinctly different effects depending upon whether the base metal had been cleaned anodically or cathodically. Plating chromium on nickel steel wire, anodically cleaned, produced a very closely adherent deposit so that it was difficult to detect the joint. Mr. Hogaboom, who was the first to observe the effect reported upon by Blum and Rawdon, referred to his experiments on silver plating flat ware. The difference in structure would even become apparent upon polishing.

A second contribution by the Bureau of Standards was a paper on "Current Distribution and Throwing Power in Electrodeposition" by H. E. Haring and W. Blum. "Throwing power" in electrodeposition may be defined as the deviation of the actual metal distribution from the primary current distribution. It was shown mathematically and experimentally to be dependent upon (a) the rate of change of cathode potential with current density, (b) the resistivity of the solution, and (c) the cathode efficiency at different current densities. A simple apparatus for the measurement of throwing power was demonstrated and developed which had been applied to the study of copper sulphate and cyanide solutions.

"Primary current distribution" is that produced when no polarization is involved. It is a dimensional function. "Secondary current distribution" is determined by the composition and electrochemical properties of the solution. "Metal distribution" is determined by the secondary current distribution and the cathode efficiencies.

"The Electrodeposition of Nickel on Zinc" was carefully investigated by Dr. A. Kenneth Graham at the University of Pennsylvania. Dr. Graham found that there was a distinct advantage, when plating nickel or zinc, to use a very high current density at start. The zinc is covered so rapidly at the higher densities that not only is the possibility of secondary reactions reduced to a minimum while plating, but within 75 sec. at 5 amp./sq.dm. and 60 sec. at 6 amp./sq.dm. the potential had become positive enough (—0265 v. to the solution used as compared to —0.473 v. for sheet zinc) to eliminate entirely the danger.

Commenting on Dr. Graham's paper, Charles P. Madsen of New York, originator of the ductile nickel deposits, emphasized the importance of closely adhering to prescribed conditions if good, adherent deposits of nickel on zinc are desired.

M. R. Thompson of the Bureau of Standards submitted a detailed contribution on "The Effect of Iron on the Electrodeposition of Nickel." The work at the bureau indicates that if the p_H is properly controlled, the presence of iron in the nickel solutions does not necessarily cause cracking or peeling of the deposits, as it has often been supposed to do. Deposited iron has a primary effect upon the crystalline structure of nickel deposits, rendering the latter finer grained and therefore probably harder, although more brittle. Occluded basic precipitates containing iron may injure a deposit by making it porous, or dark in color.

THE SOCIETY AT THE WESTPORT PLANT OF THE DORR ENGINEERING CO.

Mr. Thompson's paper gave rise to a very lively discussion. Dr. E. A. Vuilleumier of Dickinson College was of the opinion that the peeling of nickel deposits was dependent upon two factors: the extent to which the metal as deposited tends to contract, and the degree of its adhesion to the surface plated. He found that the addition of 1 gram of ferrous iron per liter greatly increased the deposited nickel to contract. It may be that in Thompson's experiments the adhesion of the metal was greatly improved upon so that the peeling tendency was not apparent. E. O. Benjamin of New York referred to the possibility of the occurrence of small iron crystals in the deposited nickel. Dr. Graham complimented Dr. Vuilleumier upon his contractometer and emphasized the great need of similar apparatus for studying other properties of electrodeposits. Dr. Fink

inquired as to the relative corrodibility of pure nickel plate and nickel plate containing iron and suggested further study on the deposition of nickel-iron alloys with comparatively high percentages of iron along lines similar to those followed by him in the deposition of nickel-cobalt, nickel-chromium and ferrochromium alloys. Dr. Blum of the Bureau of Standards replied that they had found that the addition of iron to the nickel gave rise to a very fine crystalline deposit that was more resistant to corrosion than the ordinary nickel plate. Mr. Hogaboom pointed out that the corrosion of the base metal covered with the nickel plate may often be due to porosity of the plate. On that account it was always advisable to flash iron or steel with copper before depositing the nickel. Particles of free graphite on the surface of the iron will coat over readily with copper but not with nickel.

SPICER, TEMPLE, DORR AND OTHERS AT WESTPORT

"Notes on the Electrodeposition of Iron" were presented by Harris D. Hineline of Pittsburgh. The problem presented was that of depositing a substantial thickness of iron onto rather irregularly shaped rubber articles, this involving a process for preparing a conducting coating, a plating bath which would give good heavy deposits, in thicknesses up to 12.5 mm. (½ in.), and have a high throwing power to insure filling the crevices.

Electric Furnaces and Insulating Materials

J. C. Woodson of the Westinghouse company discussed at length "Heat Insulating Materials for Electrically Heated Apparatus." Dr. Hering suggested that the thermal ohm was the preferable unit for purely electrical engineering calculations but less serviceable when dealing with calories and B.t.u.'s. There is very often an enormous heat increase at the joint of two materials or pieces of the same material. With fluffy, finely divided or highly porous material the insulating quality improves as the compression increases, reaches a maximum and upon further compression the insulating quality gets worse. F. A. J. FitzGerald of Niagara Falls cited an instance in his experience: Two graphite electrodes were butt-connected. Passing from one to the next electrode there was a very sharp drop in temperature. It would be interesting to ascertain whether a similar drop in electric resistance occurred.

The next paper, by Frank W. Brooke of Pittsburgh, dealt with "Methods of Handling Materials in the Electric Furnace and the Best Type of Furnace to Use."

Prof. M. deKay Thompson and P. K. Froehlich of M. I. T. had investigated the "Conversion of Diamonds to Graphite at High Temperatures" and found that diamonds change slowly at 1,650 deg. C. to a substance that gives the Brodie test for graphite and that the velocity of this reaction is increased about twenty-six times by an increase of 100 deg. above this temperature.

A. E. R. Westman of the University of Toronto gave an account of his findings in the study of the "Relation Between Current, Voltage and the Length of the Carbon Arcs." For currents between 300 and 400 amp. and potential differences over the arc 55 to 20 volts, the potential difference in volts is approximately equal to the distance between the electrodes in millimeters; for currents of 700 amp. or so the voltage is less than the distance.

"Electric Furnace Detinning and Production of Synthetic Gray Iron From Tin Plate Scrap" was the title of the paper submitted by C. E. Williams, C. E. Sims and C. A. Newhall of Seattle. A study was made of the possibilities of converting tin-plate scrap or used tin cans into a marketable steel or cast-iron product by electrothermal means. It was concluded that in the electric furnace complete detinning is impossible and any detinning is impractical. Attempt was made to use NaCl, FeS and oxidizing slags to remove the tin. No tin is volatilized ordinarily when scrap is melted in the electric furnace, although cupola melting may remove up to 50 per cent tin depending on oxidizing conditions. Study was also made of the possibility of producing gray cast Fe without removing the tin, since under conditions prevailing in many parts of the country tin-plate scrap cannot be profitably treated by any established method. Since 1 per cent or less of tin has been found to have no serious effect on cast Fe, scrap may be usefully and efficiently melted in the electric furnace after being diluted with tin-free scrap.

Excursion to Westport, Conn.

The social program arranged for Friday was pronounced by many the liveliest and most enjoyable ever experienced by the society. Dr. Dorr and Mr. Spicer invited all the members to the Westport mill, where amid the most beautiful and idyllic surroundings a bounteous luncheon was served. The mill is situated on a river and many couples spent the afternoon rowing. Others went on to the Westport Country Club, where a very exciting golf tournament was staged by the men while the ladies enjoyed bridge or walks. During the dinner, which was tendered by the New York section of the society and for the arrangements of which Irving Fellner was responsible, the golf prizes were awarded as follows: A beautiful silver loving cup, donated by Mr. Dorr, to Frank J. Vosburgh. A fine golf stick, as booby prize, to Robert Burns. The members were then entertained by a hilariously funny song, a parody of Mr. Gallagher and Mr. Shean, sung by Mr. Lidbury and Mr. Hinckley.

The dance that followed in the evening was so thoroughly enjoyed that when time was called at 9:30 there was universal groaning at the thought of returning home. Members, however, were in such good spirits that they kept up the jollification in the private trolleys and the private coaches, and great was the applause and enthusiasm as Mr. Saunders led the singing of the Famous A.E.S. classic, "We're From Niagara."

Saturday morning was devoted to papers on the rarer metals, their production and utilization. This session will be reported in full in our next issue.

Foundrymen Meet at Cleveland

Hold Very Important Exhibition of Labor-Saving Machinery —Notes on Technical Sessions Devoted to Non-Ferrous Metals and the Testing and Reclamation of Foundry Sand

TECHNICAL and engineering societies in the United States may be roughly divided into two general classes—namely, those not conducted for profit, and those that are in business. The latter in turn may be subdivided into those in the publishing business, and those in the exhibition business. Inspection of the exhibit of the American Foundrymen's Association held early in May and which overflowed the arena, stage, cellar and corridors of the new Cleveland Auditorium, gives the impression that, whatever the balance sheet from a society publication, it certainly must pay to run a "show." The finances of the Foundrymen and of the Steel Treaters—which has been in business only one-quarter as long—reflect this happy state of affairs. It apparently is easier to sell space in an exhibit than in a journal—a conclusion which can be recommended to the careful consideration of professional societies generally. And judging from the throngs of people moving about, the purchasers of space must have obtained "value received."

Labor Saving Equipment Featured

That a newly completed auditorium could be obtained to house a foundry show containing much equipment in operation is evidence that the modern foundry is rapidly growing away from the smoky, dark sheds and dirty, dusty, back-breaking toil of but a few years ago. Well-ventilated steel buildings are housing the new plants, and their equipment consists of a wide variety of labor-saving machinery. Every step of the work can now be done by the aid of special machines—in fact at least two-thirds of the space in the Cleveland Auditorium was occupied by such apparatus. Not so long ago it was necessary to display machine tools at these shows in order to attract the mechanical superintendents and engineers; now the demand for better working conditions to keep contented the dwindling labor supply, and the widespread use of machines where once human labor was the sole motive power, bring all members of the production staff to a meeting where they can absorb new ideas to apply to their individual problems.

Institute of Metals

As usual, the Institute of Metals Division of the Mining Engineers held some joint sessions, where were discussed the problems of the brass founder and the properties of cast alloys.

Junius D. Edwards and C. S. Taylor, of the Aluminum Co. of America, presented a short paper on the Density of Magnesium. Using methods already described in *Chem. & Met.* (vol. 24, p. 61), the following results were secured:

Density at 20 deg. C. (gram per cu. mm.)	1.7388
Thermal expansivity (20 to 500 deg.) $L_t = L_0\ [1 + (25.07t + 0.00936t^2)\ 10^{-4}]$	
Density of solid at melting point (650 deg. approx.)	1.642
Density of liquid at freezing point	1.572
Density at 673 deg. C.	1.562
Density at 822 deg. C. (approx.)	1.478

A voluminous study of Linear Contraction and Shrinkage of Light Aluminum Alloys was presented by Robert J. Anderson, of the Bureau of Mines. It was found that under uniformly good foundry practice the linear contraction or patternmakers' shrinkage (defined as the difference in length between a casting and the pattern from which it was produced) varied from 1 to 2 per cent. Consequently it is unsafe to make important patterns for a new analysis unless its behavior is definitely known in advance. (See Table I.) Even then it must be remembered that variation in melting, pouring and molding conditions which cause a greater or lesser number of gas cavities, shrinks and pin holes will greatly influence the patternmakers' shrinkage.

TABLE I—LINEAR CONTRACTION OF CERTAIN ALUMINUM ALLOYS

Analysis	Per Cent Contraction	Analysis	Per Cent Contraction
92:8 Al:Mg	1.15	90:8:2 Al:Cu:Mg	1.08
92:8 Al:Cu	1.34	90:8:2 Al:Cu:Si	1.17
92:8 Al:Sn	1.38	90:8:2 Al:Cu:Ni	1.25
92:8 Al:Ni	1.42	90:8:2 Al:Cu:Sn	1.26
		90:8:2 Al:Cu:Fe	1.29
		90:8:2 Al:Cu:Zn	1.29
		90:8:2 Al:Cu:Mn	1.40

A similar list of linear contractions of several brasses and bronzes was presented by R. J. Anderson and E. G. Fahlman. With these, as with aluminum alloys, the shrinkage varies as the pouring temperature and size of casting, but Table II gives representative data.

Alpax

Modified aluminum:silicon alloys (recently discussed at length in our columns) formed the subject of the annual exchange paper submitted by the French Association Technique de Fonderie. It was especially interesting because Dr. Pacz, whose patents cover the methods described for making the so-called alloy Alpax, was in the audience and entered into the discussion. He pointed out that the high-silicon alloys, at or above eutectic composition, need to be "modified," whereupon they become extremely useful because of their low shrinkage and generally excellent founding characteristics, a high elongation and tensile strength, and good

TABLE II—LINEAR CONTRACTION; ALLOYS OF COPPER

Nominal Composition	Pouring Temp., Deg. F.	Linear Contraction, Per Cent High and Low Pouring Temp.
56:40:1:1.5:1.5 Cu:Zn:Fe:Al:Mn	1,900	2.17—2.19
60:40 Cu:Zn	1,900	1.80—1.89
70:30 Cu:Zn	2,000	1.75—1.77
60:38:2 Cu:Zn:Sn	1,900	1.69—1.875
70:29:1 Cu:Zn:Sn	1,950	1.65—1.67
86:4:6:3:1 Cu:Ni:Sn:Zn:Pb	2,300	1.43—1.425
85:5:5:5 Cu:Sn:Zn:Pb	2,300	1.425-1.47
87:7:5:1 Cu:Sn:Zn:Pb	2,250	1.40—....
80:20 Cu:Sn	2,200	1.375-1.55
76:7:4:13 Cu:Sn:Zn:Pb	2,300	1.37—1.37
88:10:2 Cu:Sn:Zn	2,350	1.33—1.30
88:8:4 Cu:Sn:Zn	2,300	1.33—....
86:11:3 Cu:Sn:Zn	2,300	1.33—1.39
90:6:3:1 Cu:Sn:Zn:Pb	2,300	1.33—1.43
84:10:5:1 Cu:Sn:Zn:Pb	2,300	1.32—1.35
84:11:5 Cu:Sn:Zn	2,300	1.32—1.36
85:15 Cu:Sn	2,300	1.31—1.45
89:8:10:0.2 Cu:Sn:P	2,400	1.275-1.28
90:10 Cu:Sn	2,400	1.275-1.30
89:5:10:0.5 Cu:Sn:P	2,400	1.26—....
80:10:10 Cu:Sn:Pb	2,300	1.25—1.31

resistance to salt-water corrosion. However, they are not as stiff as other aluminum alloys—thus the proportional limit of a typical Alpax alloy is about 6,000 lb. per sq.in.; 92:8 Al:Cu alloy (No. 12) is 8,000; while heat-treated and aged alloy like duralumin is 15,000 lb. per sq.in. Alloys containing about 5 per cent silicon are also extremely useful in the foundry. Due to their low contraction on freezing they may be used to produce very difficult castings, impossible to be made in other analyses. Their tensile strength is low, but they require no special treatment or "modification."

Melting and Pouring Practice

Some very instructive "Notes on the Proper Melting and Pouring of Brass and Bronze" were presented by F. L. Wolf and William Romanoff, of the Ohio Brass Co. In their opinion the great damage to tensile properties observed after pouring at only 100 deg. F. above the correct temperature is due to gasification occurring in hot furnaces, rather than any chemical oxidation. If overheating is the only thing wrong with a melt, it will produce good results if cooled before being poured. After comparing the action of the indirect arc furnace, the Schwarz gas furnace and the Steel-Harvey crucible furnace, it was hard to decide which was best—any type would give excellent results. Crucible furnaces melted cheapest and gave castings of intermediate strength. Electric furnaces cost most to operate, gave best physical tests, and kept zinc fumes down to the minimum. The authors report they have been able to use any percentage of return scrap in their mixes, as long as it is clean. Expensive fluxes are unnecessary when melting good metal. Deoxidizers must also be used with judgment and in great moderation. Aluminum ruins a water-tight casting; silicon is also bad for a brass containing a little lead.

While it is well known that annealing will reduce internal stresses in worked material, R. J. Anderson has experimented on similar treatment of cast bronze rings. It has been known that 1 year's aging is required to produce stability in size in such castings of 87:7:5:1 Cu:Sn:Zn:Pb. $\frac{5}{16}$-in. rings, $5\frac{3}{8}$-in. diameter, were cast, sawed at one place and definite stresses (below the elastic limit) induced by wedging. It was then found that heating to 400 deg. C. relieves most of this stress quickly, 1 hour at 500 deg. removes nearly all. Very little effect was noted on the ordinary physical properties; suppression of cored structure is the only observable change. Such treatment will insure that a flat casting will remain flat after machining.

Testing of Molding Sand

Several long investigations on the selection of foundry sand and its reclamation after use have been in progress, under the general direction of R. A. Bull. As the result of these labors, a series of tests was reported by R. E. Kennedy, of the University of Illinois, whereby the principal properties of hand-molding sand can be measured.

First, a test for bond: Well-mixed sand, having a known amount of moisture, is riddled into a special molding box 1 in. wide, 10 in. long and $1\frac{3}{4}$ in. high from a known height. As each portion of sand is added, the tops of the little piles in the mold are leveled with a series of strikes, each of which just touches the high spots. In this way the mold is filled with loose sand, a closely fitting cover[1] laid on and the sand compacted under six blows of a 20-lb. weight, falling 16 in. The sides and ends of the mold are then carefully dismantled, and the prism pushed slowly over the end of the bottom board. The average weight of the pieces which overhang and break off is a measure of the bond or cohesiveness. Since the thickness of the compacted sand varies with its origin and moisture content, it is recommended that the weight be figured back to that of a fragment of a prism of dry sand, exactly 1 in. thick.

[1]A thick block of wood, laid edgewise.

Second, a test for "grain," or fineness: A sample of dried sand is shaken one hour in a $\frac{1}{20}$ per cent NaOH solution to deflocculate the clay or bonding substance contained on the grains. Washing is done by shaking the sand with fresh water, settling for 5 minutes and siphoning off the liquid from a point 2.5 cm. from the residue, repeating the operation until the wash water is clear. The residue is filtered under suction, dried 30 minutes at 105 deg. C. and then screen-sized for 15 minutes in a "Ro-tap" machine. In this way amounts of sand remaining on 6, 12, 20, 40, 70, 100, 140, 200 and 270 screens may be weighed; the results are best expressed by plotting weight of the fractions against the size of sieve opening.

Permeability of Molding Sand

Third, a test for permeability: This property permits the passage of gases and allows the mold to properly "vent." Consequently the test measures the flow of air through a standard sample. First dry the sand carefully, and then mix with a measured quantity of water. This may be done on a plate inclosed in a little tent made of moist muslin. Screen twice and store in an airtight jar while checking the moisture content. A tolerance of ± 0.2 per cent is permissible. Sufficient sand is then placed in a 2-in. brass cylinder to make a briquet 2 ± 0.08 in. high after being rammed three times by a 14-lb. weight dropping 2 in. This briquet is then placed in a container, and air forced through it. A recommended form of apparatus consists essentially of a calibrated vessel from which air is displaced by water flowing in from a reservoir under a constant head of $22\frac{1}{2}$ in. Air so expelled passes through the sand sample, and the resistance to this flow sets up a pressure in the exit tube which is measured by a simple manometer. A stop watch measures the time required to pass each liter of air.

$$\textit{Permeability} = \frac{\textit{Air passed} \times \textit{height of specimen}}{\textit{Pressure} \times \textit{area of specimen}} \times \frac{60}{\textit{Time}}$$

(All measurements in c.g.s. units.) The committee recommends that 2 liters of air be forced through; and with the standard specimen the equation becomes

$$\textit{Permeability} = \frac{30{,}070}{\textit{Pressure} \times \textit{seconds}}$$

In addition to these three simple tests, an auxiliary test is suggested as desirable. It is called the dye adsorption test, and is a measure of the quality of clayey material present in the sand. In general these materials are hydrated silicates in the colloidal condition; a considerable quantity is usually associated with a sand of strong bonding qualities. To execute the test, a given weight of sand is shaken with water and alkali, and the suspended material removed by siphon or decantation. A measured amount of crystal violet is then added to the liquor and the resulting color compared against standard solutions; 1,200 to 1,500 mg. of dye will be adsorbed by the colloids in 100 grams of sand if it has a strong bond; weak bonds adsorb as little as 200 mg.

Equipment News

From Maker and User

Machinery and Appliances for Production and Control

Materials and Accessories for Chemical Industries

Steel Belt Conveyors

Steel belt conveyors have been made and sold on the European market for a number of years by the Sandvik Steel Works, of Sandviken, Sweden. During the past year this company has brought its product to the American market, and there are already a number of installations in operation and several more are being erected.

These conveyors are similar in design to a flat belt conveyor using a rubber or canvas belt. The novelty consists in the use of a flexible steel belt. This belt is made of cold-rolled, hardened and tempered Swedish charcoal steel. It is supplied in lengths up to 350 ft. and can be easily pieced where greater lengths are required. Widths can be had up to 18 in. and thicknesses from 0.8 mm. to 1.0 mm.

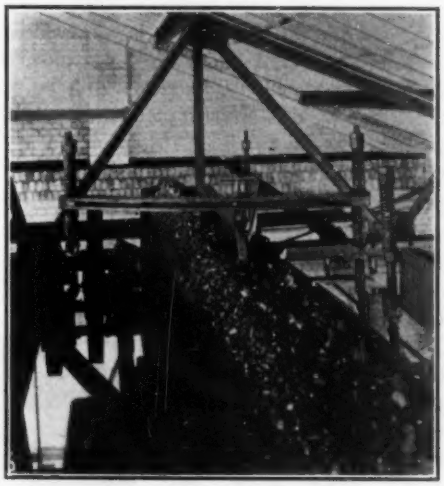
This belt cannot be troughed but it is claimed by the makers that, due to its rigidity, it can be loaded over almost its entire width—so that an 18-in. steel belt has a carrying capacity about equal to a 30-in. flat rubber or fabric belt and the same as an 18-in. troughed fabric or rubber belt. When handling non-abrasive materials the belt can be run at the bottom of a wooden or steel trough, built narrower than the belt and clearing it, or built wider with ample clearance for the edges of the belt and a greater capacity thus obtained than with a standard troughed belt.

The installations of this belt are made in two ways, which are called the "sliding type" and the "rolling type" of conveyor. The sliding conveyor, for handling non-abrasives, has the steel belt sliding on wooden runners which acquire such a high polish that the friction is nearly negligible. In the rolling conveyor belt strands are carried on idlers, according to usual belt conveyor practice. At times these two types have been used in combination.

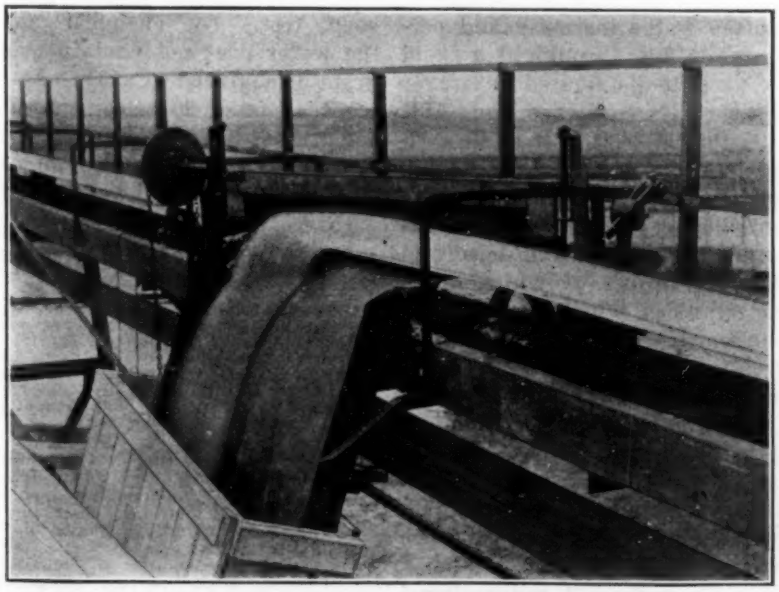
Many advantages are claimed by the makers for the steel belt conveyor. Among these might be mentioned: It can be used for handling hot, sticky or abrasive materials which a rubber or textile belt cannot handle satisfactorily. It is very easily kept clean on account of its smooth surface—such sticky material as sugar, for instance, can be easily and efficiently scraped off with a steel scraper. It is rust resistant—it can be used in the chemical field handling wet and hot materials, and can be run in the open air in all kinds of weather. It can be made perforated without appreciably influencing its life and can be then used handling materials where a great deal of liquid must be eliminated. Another advantage is the discharge feature—materials can be discharged at any desired point without the use of cumbersome and expensive trippers. The belt does not stretch and the

Where the Steel Belts Are Installed in the United States and Canada

	No. of Units	Material Handled
Mathieson Alkali Works, Saltville, Va.	2	Phosphate rock
Penn-Allen Cement Co., Nazareth, Pa.	1	Limestone
Michigan Portland Cement Co., Chelsea, Mich.	3	Hot clinker Cold clinker
Hercules Cement Co., Hercules, Pa.	1	Lump coal Hot clinker
Waukesha Lime & Stone Co., Waukesha, Wis.	1	Crushed rock
Phosphate Mining Co., Nichols, Fla.	1	Phosphate rock
Stevens Bros. & Co., Stevens Pottery, Ga.	2	Clay
American Sugar Refining Co., Brooklyn, N. Y.	1	Wet sugar
Kearns-Gorsuch Bottle Co., Zanesville, Ohio	1	Coal
Installations Under Process of Construction		
Crane Co., Chicago, Ill.	1	Sand
Dodge Bros., Detroit, Mich.	2	Sand
Canada Sugar Refining Co., Ltd., Montreal, Canada.	4	Wet sugar
Great Western Sugar Co., Greeley, Colo.	1	Coal



ROLLING TYPE BELT, DISCHARGING HALF BY PLOW AND HALF OVER END



ROLLING TYPE BELT, WITH FIXED PLOW FOR DISCHARGE ON ONE SIDE ONLY

tension devices are very simple; care must be taken only of trifling variations in length caused by temperature changes.

CONDITIONS GOVERNING USE

The operating speed when using steel belt depends on the length of the conveyor. This speed varies ordinarily between 135 and 300 ft. per minute. For the average conveyor 200 ft. per minute is found to be best. The terminal pulley diameter should be about 1,000 times the belt thickness. In passing over this pulley the belt is subjected to a stress of from 28,000 to 30,000 lb. per sq.in., but it has been found that, with a bending frequency for any section of the belt of about once per minute the molecular structure of the steel is not affected. The manufacturers recommend the belt for a great many materials, among which may be mentioned: clinker, cement, sand, rock, ore and ore concentrates, coal, coke and charcoal, carbide, silica, soda, salt, sugar, cassettes and beet pulp, milk powder, yeast, vegetables, candies and chocolate, deals, battens, slabs, edgings, chips and sawdust, clay, gypsum, brick and briquets, bags, boxes, packages, steel forgings, guncotton and glass. Over 1,400 of these conveyors have been installed in different phases of industry all over the world. A large number have been installed in the South Sea Islands for handling phosphate rock.

SLIDING TYPE BELT, WITH MOVABLE PLOW FOR DISCHARGING ON BOTH SIDES

Water Softeners

At the present time there are several commercial zeolite water softeners on the market. These substances have undergone considerable change since the first successful softener of this type appeared. The different zeolites vary in weight, in ability to absorb hardness from water and in quantity of salt needed to restore the so-called initial exchange capacity. Most of these use the natural green sands or marl beds in the vicinity of Medford, N. J., as the base of their composition. The finished products are usually very fine, greenish to reddish in color, have limited exchange capacity and high physical loss or depreciation in capacity.

Exchange capacity refers to the amount of $CaCO_3$ a zeolite substance will remove in terms of its own dry weight or the number of gallons of water softened per pound of mineral used. The process is sometimes referred to as one of selective absorption or "substitution," as none of the salts in a natural water are eliminated, but only change in form. The exchange capacity depends upon the physical structure of the mineral, which grades from colloidal, to crystalline, to amorphous substances. The latter have a hard bricklike consistency with little exchange value. The former have high reactive value, will soften water instantly and permit water to flow through at a rapid rate. A zeolite distributed by Graver Corporation, East Chicago, Ind., falls into the former class. It is an artificial mineral prepared by the precipitation of sodium aluminate with sodium silicate. The resulting product is filtered, washed and dried and has the appearance of white, small porous granules which do not dissolve in water. This mineral has two to three times the exchange capacity of some other zeolites. Each pound will absorb 9.1 grams of hardness expressed in terms of calcium carbonate. One-tenth of a pound salt is required per pound of mineral, which is equivalent to 5 grams of salt per gram of hardness removed. In some of the older zeolites a salt ratio of 8 to 1 is quite common.

The Graver zeolite will operate uniformly for a period of 10 to 12 hours. It will operate at an overload of 500 per cent in water 30 grains hard and 200 per cent in water of 12 grains hardness per U. S. gallon. This is a valuable property, as it takes care of fluctuating loads or excessive peaks 200 to 500 per cent above normal. It is a quick regenerating zeolite. The salt solution is not over 20 minutes in contact with the mineral bed, and the entire process of regeneration or restoration does not occupy an hour. As the salt requirement is very low, no artificial method of salt recovery or salt reclamation is used to lower the amount of salt required. Such methods are open both to mechanical and chemical objections. A simple gravity flow is used and by means of a specially designed brass lateral system immediately above mineral bed, the top of the salt tank is no higher than top of steel shell. This conserves head room, obviates the necessity of a pit or placing the brine tank on a second floor level. It is more positive than the siphon method used with ground operated salt tanks. This zeolite will regenerate repeatedly without depletion of original exchange ability. Many charges have operated for over 1,000 regenerations and have given a uniform grade of soft water. It produces "zero" water by soap test. By chemical analysis the water does not contain over 0.5 grain of equivalent $CaCO_3$. As many zeolites cannot do better than 0.8 to 1.4 grains, it is possible by the use of a precipitated zeolite almost to approach the distilled water standard.

Catalogs Received

GENERAL ELECTRIC CO., Schenectady, N. Y.—Catalog 6002. A catalog of railroad supplies covering the General Electric Co.'s full line of supplies for use with electric railways of different types. This catalog supersedes all others on the subject, and contains a price list supplement with prices correct to October, 1922.

J. H. R. PRODUCTS CO., Willoughby, Ohio —Leaflet describing the J. H. R. products, chiefly barium peroxide.

BRISTOL CO., Waterbury, Conn.—Catalog 1006. A new catalog describing the Bristol line of recording gages for pressure and vacuum.

DETROIT RANGE, BOILER & STEEL BARREL CO., Detroit, Mich.—A new pamphlet descriptive of the various styles of steel barrels and drums manufactured by this company.

Synopsis of Recent Literature

Aluminum Bronze as an Engineering Material

By aluminum bronze is meant, not the gray-white metallic coating used on radiators, but rather a strong, reliable metal resembling 0.35 per cent carbon Swedish bessemer steel to a remarkale degree. The color, of course, is different, but the mechanical properties are much the same. It resists alternations of stress unusually well and is superior to nearly all of the non-ferrous alloys except Monel metal in this respect. Aluminum bronze is essentially 90 to 92 parts of copper and 8 to 10 parts of aluminum, while Monel metal is approximately two parts of nickel to one part of copper. Naturally, the two metals behave differently with respect to corrosion, but they are much alike in strength and hardness. Both hold their strength much better than other alloys when exposed to elevated temperatures, a fact of importance to the engineer.

Properties—Aluminum bronze is about the color of 10-carat gold, has a tensile strength of 70,000 lb. per sq.in., and an elongation of 15 per cent. Its Brinell hardness number is 100-110. These properties place it in the class of strong bronzes suitable for the most exacting service. Particular mention should be made of its resistance to alternating stress or fatigue. In the Landgraf-Turner endurance-testing machine the aluminum bronzes resisted 4,500 blows before fracture, while the manganese bronze resisted about 500.

The other strong bronze, manganese bronze, has many admirable properties, but it is not adapted for bearing surfaces. Aluminum bronze has proved its worth in this field in such parts as worm-wheel gears. Every day's output of 1,000 Ford trucks carries 12,000 lb. of this metal in gears. Extensive tests of aluminum-bronze gears against phosphor bronze in one-man tanks during the war proved the superiority of the former for this most difficult service.

Almost constant trouble was experienced with large spur gears on the locomotives on the Mt. Washington Railway until aluminum bronze was tried. Its service there has proved eminently satisfactory.

Pickle-crate equipment made of aluminum bronze has been found to withstand the action of sulphuric acid well. This fact, combined with its strength, fits it for this purpose. The property of resisting abrasion is useful for gears, but aluminum-bronze trolley wheels have been found to give remarkable service for the same reason. The toughness of the alloy is useful here as well, because the effect of a severe blow can be readily corrected under the hammer without breakage.

Adaptability—Aluminum bronze is tough when cold, but is more so when red hot. This property makes forgings possible and also helps materially in the manufacture of die castings from this metal. The process is a commercial one, for the dies are made so that they will withstand at least 10,000 openings in most shapes. The solving of the die problem is of equal importance with the metal problem, for one cannot proceed without the other. The property of toughness is useful also in Jordan bars for beating engines. With its freedom from corrosion, the tough aluminum-bronze Jordan bar has been an increasing success in the paper industry.

Machinability—Many excellent properties of aluminum bronze have been mentioned, but it has its drawbacks. First, at least at present, is the difficulty of machining, compared with other bronzes or brasses. This does not mean that it cannot be machined readily under proper conditions, but that, compared with ordinary brass or bronze, its toughness makes it more difficult to handle in the machine shop. Sharp tools, kept so, of the proper angle are essential to success. Ample lubrication is necessary. With these precautions a most excellent job can be done as is evidenced every day at the Ford factory in Detroit. Aluminum bronze most nearly resembles mild steel in its machinability.

When one sees the stacks of golden-bronze worm wheels in the gear department of the Ford company and examines the polished surface of the gear teeth left after the machining operation, there can be no doubt that aluminum bronze as an engineering material has arrived and that its excellent properties have been made available to the engineer because scientific research solved the problems of its manufacture in the foundry.

The second objection to aluminum bronze might be its cost, which is about 25 per cent more than that of brass or bronze. But when compared with special bronzes with somewhat similar properties the difference in cost disappears.

Like all high-grade metals, it must be manufactured under careful supervision, and more than usual care must be used in the casting shop and foundry.

Wrought Aluminum Bronze—Most of the remarks thus far have referred to cast aluminum bronzes, but as rolled or wrought alloys are commercial products and are manufactured in large quantities the author quotes from W. H. Bassett, whose experience with these alloys gives authority to his statements:

"Copper-aluminum alloys can be made in wrought form in any proportions up to an aluminum content of approximately 10 per cent. Three alloys, however, are used principally. These contain 5, 8 and 10 per cent aluminum, respectively. All three alloys hot-roll easily, and these same remarks would apply to the cold-rolling of the 5 and 8 per cent. The 10 per cent aluminum bronze does not cold-roll readily, in fact would not be considered a cold-working alloy.

"The 5 per cent aluminum bronze is furnished principally in the form of sheets. It has, when cold-rolled, a tensile strength as high as 100,000 lb. per sq.in., depending upon the degree of hardness or cold-rolling, and an elongation in 2 in. of 10 per cent. When annealed this alloy has a tensile strength of 55,000 lb. per sq.in. with an elongation of 75 per cent in 2 in. This high elongation for annealed 5 per cent aluminum bronze is characteristic of the material, and it is rarely equaled in the other non-ferrous alloys.

"The 8 per cent aluminum bronze is manufactured extensively in both rod and sheet form, and is supplied, when resistance to wear is also required, in connection with the other general physical properties given for aluminum bronze.

Important Articles In Current Literature

More than fifty industrial, technical or scientific periodicals and trade papers are reviewed regularly by the staff of *Chem. & Met.* The articles listed below have been selected from these publications because they represent the most conspicuous themes in contemporary literature, and consequently should be of considerable interest to our readers. Those that are of unusual interest will be published later in abstract in this department; but since it is frequently impossible to prepare a satisfactory abstract of an article, this list will enable our readers to keep abreast of current literature and direct their reading to advantage. The magazines reviewed have all been received within a fortnight of our publication date.

SOME GENERAL CONSIDERATIONS OF THE GUMMY METER PROBLEMS IN THE GAS INDUSTRY. R. L. Brown. *American Gas Association Monthly*, May, 1923, p. 309.

THE DISTILLATION OF AMMONIACAL LIQUOR. W. Mason. *Gas Journal*, April 25, 1923, p. 219.

THE FUNCTIONS AND DUTIES OF THE CHEMIST AND THE BEARING OF CHEMISTRY ON THE GAS INDUSTRY. G. H. Gemmell. *Gas Journal*, April 25, 1923, p. 220.

COKE OVENS AND TOWN'S GAS SUPPLY. Walter Chaney. *Gas Engineer* (London), April 1923, pp. 79-81.

WASTE OF MATERIALS. H. M. Sutton. *Bulletin* of the Taylor Society, April, 1923, pp. 77-78.

BUILDINGS FROM THE MANAGER'S VIEWPOINT, PART III. G. L. H. Arnold. *Management Engineering*. May, 1923, pp. 329-333.

MISPLACED MODESTY IN THE USE OF COSTS. L. M. Lamb. *Paper Trade Journal*, April 26, 1923, pp. 57-58.

FURTHER INVESTIGATIONS INTO THE PHYSICOCHEMICAL SIGNIFICANCE OF FLASH-POINT TEMPERATURES. W. R. Ormandy and E. C. Craven. *Journal* of the Institution of Petroleum Technologists, February, 1923, pp. 33-68.

LABOR HANDICAPS PHILIPPINE RUBBER CULTURE. F. A. Suberling. *Rubber Age*, April 25, 1923, p. 63.

AN OUTLINE OF BRITISH PROOFING METHODS. M. M. Heywood. *India Rubber World*, May 1, 1923, pp. 491-494.

A STUDY OF LIME KILNS. (To be cont'd.) A. E. Truesdale. *Rock Products*, May 5, 1923, pp. 28-29.

THE MODERN TREND IN FERTILIZER PLANT OPERATION. E. H. Armstrong. *American Fertilizer*, April 21, 1923, pp. 23-25.

"This alloy is in more general use than any of the other wrought aluminum bronzes. In the form of sheets when cold-rolled the tensile strength may be as high as 130,000 lb. per sq.in., with 4 per cent elongation. When annealed this same material has a tensile strength of 60,000 lb. per sq.in. and an elongation of 60 per cent. The generally high tensile strength makes this material very valuable for many engineering purposes.

"Rods in 8 per cent aluminum bronze can also be supplied with approximately the same physical properties as sheet metal. However, it is customary to furnish them in a medium temper with a tensile strength of about 85,000 lb. per sq.in. and an elongation of 30 per cent.

"The 10 per cent aluminum bronze has, of course, the highest tensile strength and lowest elongation of this series. Owing to the fact that it can be only very slightly cold-worked, it does not have the range in physical properties as shown by the other alloys. Its tensile strength may be taken as 75,000 lb. per sq.in. and elongation as 25 per cent. There is not a great demand for this class of material, but when supplied it is usually furnished in the form of hot-rolled sheets, hot-rolled or extruded rods, and extruded shapes. This alloy can also be heat treated to some extent, in a manner similar to steel. By heating and quenching, its physical properties are improved to some extent, depending upon the exact composition of the material. It has been found that an addition of iron up to about 3 per cent in 8, 9 and 10 per cent aluminum bronzes improves their physical properties, workability, resistance to corrosion, etc."

The author's experience with a large variety of alloys from the manufacturing and the engineering viewpoint confirms his belief that the aluminum bronzes as a class are valuable additions to our list of engineering materials, and if he has pointed out some of the salient points, sufficient to arouse the interest of the engineer to investigate their merits further, the purpose of this paper will have been accomplished.—*W. M. Corse, Chairman, Division of Research Extension, National Research Council, in "Mechanical Engineering," May,* 1923.

Lignite Char: Its Production and Possibilities

At the spring meeting of the American Society of Mechanical Engineers, in Montreal, Canada, O. P. Hood, chief mechanical engineer of the U. S. Bureau of Mines, will read a paper on this subject. In this paper, preprinted in *Mechanical Engineering* for May, 1923, Mr. Hood says in part that the greatest difficulty with our lignite is the fact that in nearly every district where it should be the natural fuel it is put in competition with high-grade fuel. We are all spoiled by having been blessed with an abundance of the best, so that we are impatient with the limitations of lower-grade fuels. If we had been obliged to go down 2,000 ft. or more and win good coal from thin seams in scattered districts as they do in Europe, we should long ago have worked out a successful technique for utilizing our lignites. Canadian and North Dakota lignite must compete with anthracite and with Pittsburgh and Illinois bituminous coal; our Texas lignite must compete with gas, oil and Oklahoma bituminous coal. It is evident, however, that there must be a price at which the lower-grade fuel will begin to be attractive. In round numbers the ratio is somewhere in the neighborhood of half the price of good coal. With the rising price of bituminous coal we are fast approaching the time when this ratio will be common.

The handicaps of lignite are well known but not always properly valued. The heating values of high-moisture fuels are somewhat misleading. The heat carried by the moisture is recovered and measured in the calorimeter, but it is not fully utilized in a boiler funace. The B.t.u. ratios, therefore, do not give the relative possible steaming values of the fuels if comparison is made between a high-moisture lignite and a low-moisture bituminous coal. Although the ash percentage may be low, there is usually a larger total amount of ash to handle in a plant using lignite. The fusing temperature of the ash is usually low, making high rates of combustion difficult and requiring larger grate areas and furnace volumes than with higher-grade coal. Notwithstanding these handicaps, with present technique, raw lignite can be used in large operations, and good efficiencies and reasonable capacities can be obtained. The problem is largely an economic one. When raw lignite is cheap enough in comparison with better coals it will be used in large steam-raising operations.

Improvement of Raw Lignite for Fuel Purposes

The search for a means to improve the fuel, however, must continue. A fuel classed as lignite in northern Bohemia, and weathering much as does our lignite, is as carefully prepared for market as is our anthracite. Seven prepared sizes are offered to the market. Raw lignite can probably be somewhat improved for steam raising by sizing the product more closely than is common practice. It is probable, however, that an improved lignite product must first cater to a special trade that will pay a special price. This is illustrated by the vision that has been so frequently held of improving the lignite by some process involving briquetting. Unlike the German "Braunkohle," our lignites do not make a stable and satisfactory briquet simply by drying the lignite and briquetting by heat and pressure. They lack sufficient inherent binder to consolidate and waterproof the mass. The necessary added binder increases the cost and hardly improves the quality. A quite satisfactory fuel can, however, be made by briquetting lignite char, and it is probable that some day such a fuel will be in common use.

There have been hopes that through the recovery of byproducts sufficient credits might be obtained to materially lessen the cost of briquets. Profit can be shown on paper, but such a process is essentially a large-scale operation requiring a large investment and very substantial financial backing by those familiar with technical enterprise. It is difficult, therefore, to start such an industry, for there is no opportunity to begin small and grow up, returning profits into an improved plant. Capital familiar with technical enterprise finds less hazardous ventures, and capital unfamiliar with such enterprise is apt to be misled and lost.

Lignite Char and Its Possibilities

With these facts in mind, the United States Bureau of Mines is investigating the possibilities of a somewhat different program which has for its main features an inexpensive carbonizing device and the use of the lignite char direct, without briquetting. If a market for the char can be developed, and the small mine can produce char, there would be provided means for a natural evolution of an industry that in time might realize the larger vision of briquetting and recovery of byproducts.

Lignite char can best be described in a few words as a fuel rather near in analysis to anthracite coal, but softer, with a little more volatile matter, and thus kindling easier. In size it grades from pea coal to smaller sizes, and is a stable product. Whether a market can be developed for such a fuel at prices around five dollars a ton at the mine remains to be shown, but it is at least encouraging to know that Germany used last year 400,000 tons of similar material for domestic heating and cooking. This fuel burns well with natural draft where a thin fuel bed, about 1½ in. in thickness can be maintained. Base burners, cook stoves and other heaters can be adapted to use the fuel satisfactorily. The Germans have developed a special stove, burning the fuel on a bed of ash in an inclosed drawer. There is no loss of fuel in the ash and our lignite char used in such a stove heats an oven sufficiently for baking operations and will boil water. It makes a very clean fire, is smokeless, and the char is clean to handle. It is, however, slow in getting under way as compared to a gas range.

Production of Lignite Char

To produce the char a very simple oven has been devised that greatly reduces the investment from that needed for ovens heretofore proposed. If lignite be passed through a combustion zone, moisture is first driven off; then combustible gases are distilled, and finally the solid carbon is burned. There is a considerable shrinkage in volume and a complete absence of caking quality. These steps are fairly distinct one from the other, so that the flow of lignite through the combustion zone may be so regulated that but little

of the fixed carbon is burned. The combustion zone can be maintained by burning some of the distilled gases within the moving mass of lignite, and such direct heating is more efficient than where heat must be transmitted through refractory walls. The hot gases of combustion also pass through the mass, driving off the moisture and departing fairly cool. It is something like an open-top lime kiln. The process has proved simple and efficient. Of the gas driven off, much of it is used in the combustion zone, and in addition, less than 5 per cent of the weight of the original lignite is burned. That is to say, the fixed-carbon loss in the process for drying and distilling is lower than is usually found for drying alone where separate driers are used. Passing the combustion zone the lignite enters a lower section protected from the air, where it cools and is then removed. The char obtained by such a process may, of course, be briquetted.

An oven of this sort was operated at Grand Forks, N. D., during the past summer, and about 400 tons of various North Dakota lignites passed through. In February about 100 tons of Saskatchawan lignite was tried to discover whether this presented any special problems.

About 2¼ tons of raw lignite reduce to 1 ton of char, and the heating value is about 12,000 B.t.u. per lb. The moisture is very low, and the char can be stored without danger of fire or degradation in size. Where the freight charge is heavy it would be an advantage to ship char instead of raw lignite.

Review of Recent Patents

Decolorizing Acidic Boro-Silicate Glasses With Neodymium Oxide—The color produced by iron oxide in acidic boro-silicate glasses is yellow, whereas in ordinary glasses it is green. Thus manganese dioxide, nickel oxide and selenium, so effective in neutralizing the green tint of ordinary glasses, only intensify the yellow, making the glass more of an amber. William Chittenden Taylor, of Corning, N. Y., has found that neodymium oxide, Nd_2O_3, is quite well suited for decolorizing such glasses. Instead of the pure oxide, there may be used what is commercially known as didymium oxide, a mixture of neodymium oxide and lanthanum. From 0.5 to 1 per cent of N_2O_3 is sufficient for decolorizing, and it has been found advisable to use an oxidizing batch (such as one containing a small amount of $NaNo_3$), as the color produced by neodymium is more nearly complementary to that produced by oxidized iron than by reduced iron. Boro-silicate glasses sufficiently acidic to be decolorized may be grouped as follows according to composition: Not less than 80 per cent silica; not less than 75 per cent silica, with boric oxide not less than 40 per cent of constituents other than silica; not less than 70 per cent silica, with boric oxide not less than the alkali content; boric oxide not less than 50 per cent of total constituents other than silica; not less than 60 per cent silica, with boric oxide not less than 25 per cent of constituents other than silica. A typical composition would be: Silica, 81; boric oxide, 13; sodium oxide, 4; alumina, 2. (1,449,793. Assigned to Corning Glass Works. March 27, 1923.)

Removing Colloidal Matter From Mineral Pulp—Colloidal slimes interfere with many metallurgical operations and it has been proposed to coagulate or flocculate the colloids. According to Walter O. Borscherdt, of Austinville, Va., the presence of the flocculated colloidal constituents in the pulp is very often objectionable and he suggests a procedure that is directly opposed to the one just mentioned. The colloids are dispersed by the addition of a suitable reagent such as silicate of soda and separated from the pulp in decantation tanks or thickeners. The colloid-free pulp may then be submitted to the desired treatment. Partial removal of colloids may be used to assist selective flotation. (1,448,515. Assigned to New Jersey Zinc Co. March 13, 1923.)

Manufacture of Artificial Magnesia Spinel—By fusing together in an electric arc furnace magnesite or any suitable ore high in magnesia and bauxite or other material high in alumina, a molten mass is produced which cools to a rock-like mass of a greenish or brown color consisting of masses of spinel crystals. A typical mixture may consist of 64.7 per cent aluminous abrasive fines and 35.3 per cent of a high-grade calcined magnesite. The fines used contain about 92 per cent alumina and is a byproduct of the abrasive industry. (1,448,010. Frank J. Tone, of Niagara Falls, N. Y., assignor to the Carborundum Co. March 13, 1923.)

Aluminous Abrasives — Aluminous abrasives are ordinarily produced by feeding a mixture of calcined bauxite, coke and iron borings into an electric furnace of the arc type having two depending electrodes until the furnace is completely filled. The current is then shut off, electrodes removed and the molten mass allowed to cool into a pig, which is removed, crushed, treated to remove any injurious impurities and made into grinding wheels or other articles. Using carbon to reduce the oxides of titanium, silicon and iron which occur as impurities in the bauxite often results in the formation of aluminum carbide and other reduced alumina material which causes slow disintegration of the abrasive. Thomas B. Allen, of Hamilton, Ont., substitutes metallic aluminum for coke as the reducing agent, thus obviating the possibility of forming aluminum carbide. With a calcined bauxite of the composition H_2O, 0.5; Al_2O_3, 88.0; TiO_2, 4.0; SiO_2, 5.0; Fe_2O_3, 2.5, the proportions used are 1,000 calcined bauxite, 113 aluminum and 100 iron borings. The function of the iron is to alloy with the reduced oxide impurities and by increasing their specific gravity permit a better separation from the aluminous material. They also render the alloy more readily attacked by chemical reagents. (1,448,586. Assigned to Abrasive Co. March 13, 1923.)

Purifying Clay—As a deflocculating reagent for the purification of clay, William Feldenheimer and Walter W. Plowman, of London, England, propose to use solutions of rosin in caustic alkali, alkali silicate or carbonate. It is claimed that these reagents will deflocculate clays which are not amenable to treatment by or which demand comparatively close adjustment of the concentration of reagents commonly used. (1,447,973. March 13, 1923.)

Conical Mills—This invention concerns an apparatus for entraining and removing fines from conical mills. In the conical mill, because of its construction, there is an inherent classifying action in which the fines travel automatically toward the apex of the cone, while the coarser material remains behind until it is reduced to the desired fineness. In some cases this classification of material and subsequent discharge of the fines are not sufficiently rapid and the purpose of this invention is to provide a mechanical means for aiding this action.

A current of what the inventor calls "elastic motive fluid" and might be more simply called "gas" is caused to enter the drum of the mill through a suitable inlet near the inlet of the mill and to flow parallel to the axis of rotation of the mill through the conical outlet and so out. Or an ejector may be set up in the outlet and by this means a suction set up through the mill and a current of air or other gas drawn through it in a similar manner.

This current of air or other gas flows while the mill is rotating and in this way the fines which are practically floating at the apex of the cone are entrained in the current and carried out. As the rotation goes on, fines are brought to the surface, and these are also entrained and carried out. In addition, the air current also penetrates the material to a certain extent and dislodges other fines and carries them away. (1,450,289. Harry W. Hardinge, New York, N. Y. April 3, 1923.)

Conical Mills—In the operation of a conical grinding mill with certain substances, a percentage of over-size material will be discharged with the fines. This invention is concerned with a method for returning this over-size material to the main body of the mill so

that it may be reduced to the desired size. The particular application of this invention is when the mills are operated at an overload.

A classifier of cylindrical, conical or other form is provided at the discharge end of the drum, so that the ground material is discharged into this classifier. In order to return the over-size material from the classifier to the main body of the mill, there is employed a conveyor pipe running into the mill and discharging into the same from the classifier. This pipe is provided with branches inside of the classifier so arranged as to scoop up the over-size material, which will be at the outer periphery of the classifier, and, due to the rotation of the classifier, force this material along the pipe and so deliver it back to the grinder. (1,450,290. Harry W. Hardinge, New York City. April 3, 1923.)

Sizing Composition—If Karaya gum is mixed with a small amount of oxalic acid it becomes soluble in water. In this condition it is suitable for use as a size and as such gives superior results in certain kinds of work. It is especially adapted for use in treating, coating and printing papers and textiles as a substitute for glue, soluble gums, casein and various farinaceous materials. This size is patented by R. Kaiser, of New York City. (1,448,847. March 20, 1923.)

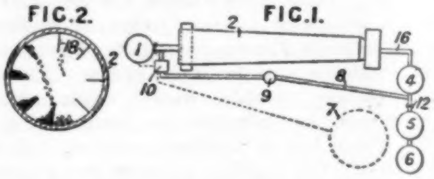
Treatment of Rubber Waste—If finely divided rubber and foreign fiber is treated with water, by sprinkling, it is acted upon by relatively cool and dilute sulphuric acid which will remove the undesirable fiber. The acid, of gravity not exceeding 30 deg. Bé., is poured over the mass, which has previously been placed in bins with screens at the bottom. The mass is left to drain 24 hours and at the end of that time another addition of acid is made. Finally water at a temperature of from 60 to 80 deg. C. is poured over the mass and allowed to percolate through. This invention, made by R. A. Terhune, Fairhaven, Mass., while involving the use of lead-lined bins, results in increased economy of the amount of sulphuric acid used and does away with the injuries effects of the old process in which sulphuric acid was used at boiling temperature. (1,450,462. April 3, 1923.)

British Patents

For complete specifications of any British patent apply to the Superintendent British Patent Office, Southampton Buildings Chancery Lane, London, England.

Carbonization—In the low-temperature carbonization of coal, lignite, peat, shale, wood and similar carbonaceous materials, hot gas after passage through a rotary retort containing the material is cleaned and preheated before being again circulated through the retort, a part of the gas and distillates being removed from time to time.

FIG. 2. FIG. 1.



Hot gas from a producer 1 is passed through the rotary retort 2 and the resulting gases and vapors passed by a pipe 16 through a tar extractor 4 and forced by a pump 9 along a pipe 8 and through a reheater 10 back to the retort. A portion of the gases may be drawn off by a valve 12 and passed through condensers and scrubbers 5, 6 to a gas-holder 7. The reheater may be supplied with gas either from the holder 7 or the producer 1.

The retort may have internal shelves 18 which serve to shower the material and which may be corrugated or set at an angle to the axis of the retort. By this construction when the feed is interrupted, the circulation of gas is continued and the retort maintained at a temperature suitable for carbonization. (Br. Pat. 192,040. W. C. White, Westminster, London. March 14, 1923.)

Dyeing Cellulose Acetate — Goods made from cellulose acetate are dyed with vat or sulphur dyes in hydrosulphite vats kept weakly alkaline by ammonia, only sufficient caustic alkali being present to form the leuco-compound; preferably salts such as barium, calcium or magnesium chloride, and protective colloids such as boiled-off liquor, gelatine, glucose or starch, are added to the vats. Examples are given of dyeing with Bromindigo and Pyrogenindigo. Specification 182,830 is referred to. (Br. Pat. 191,553. R. Clavel, Basel, Switzerland. March 7, 1923.)

Gas Condensers—In a gas condenser having oblong or rectangular tubes, the tubes are fitted at intervals with in-

American Patents Issued May 1, 1923

The following numbers have been selected from the latest available issue of the *Official Gazette* of the United States Patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.'s* staff, and those which, in our judgment, are most worthy will be published in abstract. It is recognized that we cannot always anticipate our readers' interests and accordingly this advance list is published for the benefit of those who may not care to await our judgment and synopsis.

1,453,285—Apparatus for Gathering and Transferring Molten Glass. J. F. Rule, Toledo, Ohio, assignor to the Owens Bottle Co., Toledo, Ohio.

1,453,289—Process of Separating Zinc and Lead. E. H. Snyder, Salt Lake City, Utah.

1,453,290—Method of and Means for Feeding Molten Glass. L. D. Soubier, Toledo, Ohio, assignor to the Owens Bottle Co., Toledo, Ohio.

1,453,292—Heat Exchange Apparatus. H. I. Steffa, Chicago, Ill.

1,453,310-11—Screen Filter and Rotary Filter. G. Engel, Brooklyn, N. Y., assignor to the Buffalo Foundry & Machine Co., Buffalo, N. Y.

1,453,323—Mixing Apparatus. W. E. Palmeter, Elmwood, Neb.

1,453,408—Grinding Mill. J. P. Ruth, Jr., Denver, Colo.

1,453,435—Method and Apparatus for Nitrogen Fixation. C. H. Buettner, Cincinnati, Ohio.

1,453,457—Process and Composition of Matter for Coloring Mortars. F. H. Haldeman, Cleveland, Ohio, assignor to the Master Builders, Inc., of Cleveland, Ohio.

1,453,468—Process for Making Refractory Products. L. P. Kraus, Jr., New York City.

1,453,479—Process of Treating Hydrocarbon Oils. J. P. Persch, Houston, Tex., assignor of one-fifth to B. Tolles, Hohokus, Tex.

1,453,494—Air Washing and Cooling Apparatus. P. A. Dennon, Grand Island, Neb.

1,453,515—Process of Making Vulcanization Accelerators. P. I. Murrill, Plainfield, N. J., assignor to R. T. Vanderbilt Co., Inc., New York City.

1,453,562—Process for the Production of Alkali-Earth-Metal Permanganates. R. E. Wilson, L. W. Parsons and S. L. Chisholm, Washington, D. C.

1,453,571—Process for Treating Phosphate Rock. E. P. Stevenson, Newton, Mass.

1,453,605—Coke Oven. W. E. Roberts, New York City, assignor to Foundation Oven Corporation, New York City.

1,453,655—Process for Gas Making. H. R. Berry, Brooklyn, N. Y., assignor to Petroleum Research & By-Products Co., of Wilmington, Del.

1,453,659-60—Intermediate Products for the Manufacture of Dyestuffs and Process of Making Same. Azo Dyestuffs and Process for the Manufacture of Same. G. de Montmollin, G. Bonhote and J. Spieler, Basel, Switzerland, assignors to Society of Chemical Industry in Basel, Basel, Switzerland.

1,453,678—Centrifugal Separator. S. S. Howell, Chicago, Ill., assignor to United Chemical & Organic Products Co., Chicago, Ill.

1,453,723—Composition for Use in Finishing Dry-Cleaned Leather. V. O. Olsen, Chicago, Ill., assignor to Charles McAdam Co., Chicago, Ill.

1,453,726—Insulating Composition and Method of Making the Same. T. C. Prouty, Los Angeles, Calif., assignor to Proutyline Products Co., Hermosa Beach, Calif.

1,453,734—Method of Refining Iron and steel. H. Thomas, Cleveland, Ohio.

1,453,735—Distillation Apparatus. R. H. Twining, Marquette, Mich.

1,453,749—Apparatus for the Dewatering, Classification and Counter-Current Washing of Solid Particles Mixed With Liquids. N. C. Christensen, Salt Lake City, Utah.

1,453,750—Apparatus for Drying Granular Products. N. C. Christensen, Salt Lake City, Utah.

1,453,764—Liquid for Treating Fabrics. A. Neusella, Chicago, Ill., assignor of one-half to A. A. Patterson, Chicago, Ill.

1,453,766—Catalyst and Method of Making the Same. E. H. Payne and S. A. Montgomery, Woodriver, Ill., assignors to Standard Oil Co., Whiting, Ind.

1,453,767 — Sugar-Packing Machine. C. C. Reese, San Francisco, J. T. Buzzo, Oakland and R. S. Woodward, Crockett, Calif.

1,453,789—Preparation of Pure Selenium Oxychloride. G. J. Fink, Niagara Falls, N. Y., and E. D. Giauque, Niagara Falls, Ont., assignors to Hooker Electrochemical Co., New York City.

1,453,928—Aluminum-Silicon Alloy and Method of Making It. J. D. Edwards, Oakmont, Pa., assignor to Aluminum Co. of America, Pittsburgh, Pa.

1,453,976—Composition for Detonators. B. Grotta, Tamaqua, Pa., assignor to Atlas Powder Co., Wilmington, Del.

1,453,984—Manufacture of Ammonium Perchlorates. R. A. Long, Tamaqua, Pa., assignor to Atlas Powder Co., Wilmington, Del.

1,453,988—Method of Briquetting Sawdust, Peat, Coal Dust and Similar Pulverous Substances. H. A. Mueller.

1,453,993—Metallurgical Refractory Material and Process of Producing the Same. C. Payton, Douglas, Ariz., assignor of fifty-five one-hundredths to Phelps Dodge Corp. of N. Y.

1,454,002—Lubricator. C. Verniaud, Quincy, Ill., assignor to G. M. C. Metallic Grease Co., Quincy, Ill.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

clined stationary baffle plates for diverting hot air away from the exterior surface of the tubes and allowing cold air to take its place. The inclined baffle plates may extend beyond one or both edges of the sides of the tubes and be connected by horizontal or inclined plates to deflect the heated air further away from the tubes. (Br. Patent 191,-644. W. Blakeley, Beechwood, Church Fenton, Yorkshire, England. March 7, 1923.)

Book Reviews

THERMODYNAMICS AND THE FREE ENERGY OF CHEMICAL SUBSTANCES. By *Gilbert Newton Lewis* and *Merle Randall*. 653 pages. Published by McGraw-Hill Book Co., Inc., New York, 1923. Price, $5.

In disclosing their purpose in writing this book the authors make the following statement in the preface:

> If during the course of the book we help disclose to the student some of the beauty and simplicity of the thermodynamic method, if we convince a few practical chemists of the extreme practicality of the results of thermodynamic calculations, if we contribute in some measure toward making chemistry an exact science, our task is rewarded.

To exhibit the beauty, practicality and exactness of chemistry is a purpose most laudable and one in which the authors have made a conspicuous success.

The material of the book is divided into three parts; the first lays the foundations of thermodynamics, the second is concerned with the applications of these fundamental principles, while the last part is devoted to a systematic consideration of the data of thermodynamic chemistry. The authors state that the average reader is not expected to read the book rapidly and consecutively, for many chapters can be mastered only by arduous study and exercise.

In the first chapter the authors point out several facts that are of extreme interest to the "practical" man. For example:

> The widespread prejudice against any practical use of thermodynamics in chemistry is not without reason, for the propagandists of modern physical chemistry have at times shown more zeal than scientific caution.

This is beautifully illustrated in the almost universal misplaced confidence in the importance of heats of reactions. Thus: "Thermodynamics shows us whether a certain reaction may proceed, and what maximum yield may be obtained, but gives no information as to the time required."

> To the manufacturing chemist thermodynamics gives information concerning the stability of his substances, the yields which he may hope to attain, the methods of avoiding undesirable substances, the optimum range of temperature and pressure, the proper choice of solvent, the limitations of methods of fractional distillation and crystallization.

Who concerned with chemical production would not give his eye teeth to be able to calculate accurately, in advance, just these data? Millions are spent annually for research that produces negative results, which could have been predicted by the man who knows the fundamentals of thermodynamics. Much of the so-called "chemical intuition" is the unconscious knowledge of thermodynamic principles.

It is not only the clearness of thought and expression that the authors use to impart their knowledge, but also the practical problems they have interspersed throughout the text. No one can work these problems and not fail to grasp the facts and principles set forth in the text.

Most engineers are familiar with the "cyclical process" method of teaching thermodynamics, a pitiful system at its best. Thermodynamics is a mathematical science and should be taught that way. No elaborate mathematics is needed, however. The authors have appreciated this viewpoint and the simple calculus used is reviewed in an early chapter, in order that the reader may grasp the real significance of the mathematical operations that are used later. The authors realize, however, the shortcomings of mathematics, as is indicated by the following philosophical statement:

> Mathematics offers a wonderful shorthand for the precise formulation of well-standardized ideas. On the other hand, the expressions of mathematics are lacking in humor, which is to say that they are not a suitable medium for those finer shades of thought which are often necessary in the exposition of ideas on the way toward standardization.

In order to present thermodynamics in a clear and exact manner the authors are forced to devise many quantities and factors that are unfamiliar to chemists not conversant with modern thermodynamics—for example, partial molal quantities, escaping tendency, fugacity, activity and free energy. Great pains are taken to define each term and to point out its practical importance. These new tools are the result of a natural development and serve to broaden the scope of thought.

The authors attack the subject first from a so-called "ideal" state and then lead up to actual conditions. Too often the books on thermodynamics confuse the reader by failing to set up a clear line of demarcation, or by placing too much importance on laws that hold only over limited fields, are filled with empirical constants and have no fundamental or theoretical significance.

"Entropy," that mysterious factor that is used by so many and understood by so few, is spoken of as the "degree of degradation," and some of the mystery has been disseminated. "Free energy" is treated as simply as heats of reactions and with remarkably practical results. Einstein's principles of relativity are used to show the definite relationship between energy and mass. The second law is stated as follows:

> When any actual process occurs it is impossible to invent a means of restoring every system concerned to its original condition.

The third law is stated as follows:

> Every substance has a finite entropy, but at the absolute zero of temperature the entropy may become zero, and does so become in the case of perfect crystalline substances.

The authors realized that thermodynamics is at the beginning of its development and not at the end. This is evinced by the following statement:

> It is conceivable that systems might be found in which these micro-organisms would produce chemical reactions where the entropy of the whole system, including the substances of the organisms themselves, would diminish. Such systems have not as yet been discovered, but it would be dogmatic to assert that they do not exist.

Approximately one hundred and fifty pages are given over to the calculation and use of free energy values. If this book can further the use of those values that are known and can create a demand for more data, it will have added more to the development of civilization and the increase of human comfort than any other chemical treatise in all history. The ideal text exposing the fundamentals of one great phase of chemistry has been approached as closely as the human intellect can accomplish it at the present day.

DONALD B. KEYES.

New Publications

THE EXPLOSIVES ENGINEER is the title of a new monthly magazine published by the Hercules Powder Co., Wilmington, Del., the first issue of which appeared the middle of March.

"THE NEW ERA IN THE STEEL INDUSTRY," by Leon Cammen, is a pamphlet describing recent developments in the process of casting iron, steel and alloys in rotating molds of metal. It is especially pointed out that thin-walled steel pipe of large diameter may be split, flattened out and marketed as plate.

THE CHEMICAL AGE YEAR BOOK, Diary and Directory for 1923 has recently been issued by *Chemical Age*, Benn Brothers, Ltd., 8 Bouverie St., London, E. C. 4, England. As indicated by its title, the volume contains a variety of material ranging from advertisements of manufacturers of chemicals and plant equipment to technical information of the kind usually appearing in engineering handbooks.

IN *Business Chemistry*, vol. 1, No. 1, sponsored by Skinner, Sherman & Esselen, Boston, Mass., it is stated that its purpose is "to turn the light of modern chemistry on the problems of business and the profits hidden in the waste-piles of industry and latent in its processes and byproducts."

THE UNIVERSITY OF ILLINOIS, Urbana, Ill., has issued Engineering Experiment Station Circ. No. 10, on "The Grading of Earth Roads," by Wilbur M. Wilson, and Bull. No. 134, on "An Investigation of the Properties of Chilled Iron Car Wheels," by J. M. Snodgrass and F. H. Guldner.

THE ASSOCIATION OF BRITISH CHEMICAL MANUFACTURERS, 166, Piccadilly, London, W. 1, England, has published its "Official Directory of Members, With Classified List of Their Manufactures." The object of the publication is to facilitate business relations between manufacturers and chemical firms and purchasers all over the world. Copies may be had from the address above at 10/6d.

"WHERE TO BUY" (Everything Chemical) is the title of a book, published in January, 1923, by S. Davis & Co., 30/31 St. Swithin's Lane, London, E. C., England, which contains sections on general chemicals, fine chemicals, plant, material and apparatus and index to trade names. Price 2s.

WERBY LABORATORIES, consulting and analytical chemists and engineers, 88 Broad St., Boston, Mass., have issued a 16-page brochure entitled "Do You Use a Chemist in Your Business?" by James H. Collins.

THE EDISON LAMP WORKS of the General Electric Co., Harrison, N. J., has issued the following booklets: Bull. L. D. 140, Index 74, on "The Lighting of Paper and Pulp Mills"; Bull. L. D. 143, Index 72, on "Lighting of the Food Industries"; Bull. L. D. 110A, Index 68, on "The Lighting of Textile Mills"; Bull. L. D. 144, on "Street Lighting With Mazda Lamps"; Bull. L. D. 141, Index 99, on "Automobile, Garage and Display Room Lighting," and Bull. L. D. 142, Index 63, on "The Lighting of Woodworking Plants."

Men in the Profession

I. V. BRUMBAUGH, of the Bureau of Standards, addressed the Baltimore Section of the American Society of Mechanical Engineers on May 9. His subject was "Causes of Carbon Monoxide Poisoning in Baltimore."

Dr. HARRY A. CURTIS has been appointed to take charge of the investigation of nitrates in the Department of Commerce survey of essential raw materials produced under monopoly conditions abroad. The major purpose of the investigation, Secretary Hoover declared, is to safeguard American consumers, both agricultural and industrial, in obtaining adequate supplies at reasonable prices.

ALFRED C. ELKINTON, president of the Philadelphia Quartz Co. of California, San Francisco, has recently returned to that city after a 7 months' tour of the Far East and antipodes.

ECKARDT V. ESKESEN, president of the New Jersey Terra Cotta Co., New York, has been elected vice-president of the National Terra Cotta Society.

F. FRANK, general manager of the Frank Laboratories, of San Francisco, Calif., expects to leave New York in the near future for an extended trip abroad. He will visit France, England, Germany, Italy, Austria, Rumania and Russia, and expects to be absent about 5 months.

C. D. GARRETSON, vice-president and general manager of the Electric Hose & Rubber Co., Wilmington, Del., has been elected president of the local Rotary Club.

T. C. HAGEMAN of Christiania, Norway, formerly consulting engineer to the Norwegian nitrogen industries, is now in the United States on business. His headquarters are at 564 79th St., Brooklyn, N. Y.

FRED J. HARTMAN, of Pittsburgh, Pa., has resigned as secretary of the Pennsylvania State Industrial Board, effective May 15, a position he has held for the past 4 years, to become assistant to Thomas S. Baker, president of the Carnegie Institute of Technology, Pittsburgh.

Dr. EDWARD P. HYDE, who organized the Nela Research Laboratories in 1908 and who in recent years has occupied the position of director of research of the National Lamp Works of the General Electric Co., has tendered his resignation to take effect June 30 of this year. Dr. Hyde will take a prolonged rest abroad.

Dr. ZAY JEFFRIES gave two lectures at the College of Engineering, Carnegie Institute of Technology, Pittsburgh, Pa., April 30 and May 1, on the subjects of "The Hardening of Non-Ferrous Metals" and "The Hardening of Steel."

RAYMOND B. LADOO, of the engineering staff of the Bureau of Mines, has resigned to become general manager of the Southern Minerals Corporation. Mr. Ladoo has specialized during his service with the Bureau of Mines in the non-metals. The Southern Minerals Corporation is planning the development of some of the non-metalliferrous resources of the South. The company is a close corporation, formed by the interests that have made a conspicuous success of the operations of the Magnesia Talc Co. in Vermont. The officers of the company are J. S. Patrick, Burlington, Vt., president; J. T. Smith, Waterbury, Vt., vice-president, and R. L. Patrick, of Burlington, treasurer. For the present the general offices will be maintained in the Continental Trust Building, Washington, D. C.

MARSHALL C. LEFFERTS, president of the Celluloid Co., Newark, N. J., has resigned from this office to become chairman of the board of directors, a position just created. He has been president since the organization of the company in 1890. HENRY RAWLE, vice-president of the company since 1912, has been elected president to succeed Mr. Lefferts.

Dr. HENRY LEFFMAN, of the research division of the College of Pharmacy and Science, Philadelphia, Pa., gave an interesting lecture on May 2 in the college auditorium on "Explosives and Explosions."

ARTHUR E. RICE, president of the Pennsylvania Salt Co., Philadelphia, has been elected director of the Market Street Title & Trust Co. of that city.

C. A. ROSE, previously connected with Guggenheim Brothers in an important capacity, has been appointed general manager of the British America Nickel Corporation, Ltd., with offices at Ottawa, Canada.

Dr. C. G. SCHLUEDERBERG, of the Westinghouse Electric & Manufacturing Co., returned to the United States the latter part of April, in time to attend the meeting of the American Electrochemical Society May 3 to 5, in New York.

Dr. E. W. SCHWARTZE, of the Bureau of Chemistry, has received a medical fellowship from the National Research Council for a year's study with Sir William M. Bayliss, professor of general physiology at the University College, University of London.

CARL J. ZIMMERMAN of Long Island City, N. Y., has been elected president of the Carbola Chemical Co., Inc., with mines and plant at Natural Bridge, N. Y. V. E. Maher was former president.

The Chicago Chemists Club, at its annual meeting May 1, elected the following: President, A. V. H. MORY; first vice-president, A. E. SCHAAR; second vice-president, H. G. WALKER; secretary, R. S. SHUEY; treasurer, O. H. WURSTER, and trustees, S. L. REDMAN and F. J. ROOT.

Obituary

Dr. FREDERICK SALATHE, chemist and geologist, died on May 7, at Santa Barbara, Calif., aged 57 years.

JOHN GILBERT WARD, treasurer of the Babcock & Wilcox Co., died on April 22.

Society Calendar

AMERICAN ASSOCIATION OF CEREAL CHEMISTS will hold its ninth annual convention at Hotel Sherman, Chicago, June 4 to 9.

AMERICAN ELECTROPLATERS SOCIETY will hold its eleventh annual meeting at Providence, R. I., July 2 to 5.

AMERICAN GAS ASSOCIATION will hold its annual convention the week of Oct. 15 at Atlantic City. An elaborate exhibition of gas-making and gas-utilization equipment is planned.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS will hold its summer meeting June 20-23 at Wilmington, Del.

AMERICAN LEATHER CHEMISTS ASSOCIATION will hold its twentieth annual convention at the Greenbrier, White Sulphur Springs, W. Va., June 7, 8 and 9.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS will hold its spring meeting May 28 to 31 in Montreal, Canada.

AMERICAN SOCIETY FOR TESTING MATERIALS will hold its twenty-sixth annual meeting at the Chalfonte-Haddon Hall Hotel, Atlantic City, beginning Monday, June 25, 1923, and ending either Friday or Saturday of that week.

CANADIAN INSTITUTE OF CHEMISTRY will hold its annual meeting in Toronto, May 29 to 31.

NATIONAL ASSOCIATION OF MANUFACTURERS OF THE UNITED STATES OF AMERICA will meet in annual conference May 14 to 16, inclusive, at the Waldorf-Astoria, New York City.

NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES (NINTH) will be held in New York Sept. 17-22.

NATIONAL FERTILIZER ASSOCIATION will hold its thirtieth annual convention at White Sulphur Springs, W. Va., the week of June 11.

NATIONAL LIME ASSOCIATION will hold its fifth annual convention at the Hotel Commodore, New York City, June 13 to 15.

NATIONAL SYMPOSIUM ON COLLOID CHEMISTRY will be held at the University of Wisconsin, June 12 to 15.

NEW JERSEY CHEMICAL SOCIETY holds a meeting at Stetters Restaurant, 842 Broad St., Newark, N. J., the second Monday of every month.

PACIFIC DIVISION, American Association for the advancement of Science, will hold its seventh annual meeting at the University of Southern California, Los Angeles, Sept. 17 to 20, in conjunction with the summer session of the national association and a meeting of the Southwestern Division of the National Association.

SOCIETY OF CHEMICAL INDUSTRY, Canadian Section, will meet in Toronto, May 29 to 31.

SOCIETY FOR STEEL TREATING — Eastern sectional meeting will be held June 14 and 15, in Bethlehem, Pa.

The following meetings are scheduled to be held in Rumford Hall, Chemists' Club, East 41st St., New York City: May 18—Society of Chemical Industry, regular meeting. June 8—American Chemical Society, regular meeting.

Industry and Trade

Current News and Market Developments

May 14, 1923

CHEMICAL & METALLURGICAL ENGINEERING

Tenth Avenue at 36th Street, New York

H. C. PARMELEE, *Editor*

News Section

Market Section

The Summary of the Week

Intersection meeting of A.C.S. at Urbana, Ill., largely attended and many papers of industrial importance presented.

Suit of government against the Chemical Foundation Inc., postponed till June 4, at Wilmington, Del.

Treasury Department announces it has no authority to transfer calcium arsenate to free list.

Lower duties are asked on linseed oil, cresylic acid, and phenolic resin, under flexible provisions of tariff act.

War Minerals Relief Commissioner recommends award to Grasselli Chemical Co. as partial recompense for losses incurred in operating a pyrites mine during the war period.

A lower price schedule for German potashes was announced last Wednesday.

The Nitrate Association, comprising leading factors in Chile, has issued new prices on nitrate of soda, covering shipments over the next year.

Figures compiled by the Department of Commerce show that exports of chemicals and allied products in March exceeded those of February to the extent of $2,500,000.

The customs service announces that members of the trade may make suggestions relative to the standards of dye strengths, which are to be adopted as a basis of levying duties, up to May 14 instead of May 7, as was first announced.

Importers have not been active in placing orders for future shipments of permanganate of potash and foreign markets are expected to feel the loss of such business.

Domestic producers of arsenic have sold round lots under the prices quoted in the open market. Imported grades are unsettled in price but show no material price changes.

Under the leadership of cottonseed oil, the entire vegetable oil list sold off in price during the week.

The movement of new crop production at a time when consuming demand had fallen off brought out another sharp decline in the prices for pure spirits of turpentine, the decline amounting to 20c. per gallon for the week.

Bichromates, both soda and potash, were advanced in price. Production is reported to be curtailed owing to scarcity of competent labor, and higher producing costs in general add to the strength of the market.

Increasing Output of Carbon Black

INFORMATION to the effect that new companies in Texas, Louisiana and West Virginia were preparing to engage in the manufacture of carbon black has reached the trade within the past 2 weeks. This is encouraging to consumers of this material, as it gives assurance that production will be along broader lines. Consumption of carbon black has increased rapidly in recent years and at times the call for deliveries has proved too heavy to be met by the producing capacity of existing plants. With increased call from the industries, producers did their best to increase the volume of output, but scarcity of offerings still featured the market, and the introduction of new producing factors will be welcomed as an evidence of a more equal balance between supply and demand.

To some extent the greater use of carbon black may be attributed to the natural expansion of the various consuming trades, but more than anything else, it has resulted from an abnormal outlet in the rubber industry. Up to 1914 the rubber trade took but small amounts of carbon black and its value to that trade was solely in the nature of a coloring agent. Then it was found that carbon black possessed qualities that made it an excellent filler for rubber. Later reports were heard that it increased the tensile strength of rubber, gave it increased toughness and resistance to abrasion. As a result the rubber trade in 1921 was classed as the largest consumer of carbon black, with annual requirements of about 20,000,000 lb., as compared with 12,000,000 lb. for the printing ink trade, which was second on the list.

The latest figures on production that are available cover the year 1921 and show that in that year the output was 58,632,700 lb., as compared with 51,321,892 lb. in the preceding year. It is generally agreed that production in 1922 showed a healthy gain over that of 1921, but the advance in production was met with an equal—if not a larger—advance in consuming demand and the rubber trade, especially the rubber tire branch, was responsible for absorbing this record output. The various trades which are consumers of carbon black have been operating on an unusually active scale so far this year and it is reasonable to suppose that their increased use of raw materials has extended in a proportionate way to carbon black. To take care of increased home consumption and to conserve our export trade, it is necessary to keep production figures at a level which will permit of unrestricted buying and the news that several new companies were entering the carbon black industry is of interest to consumer and producers alike.

Treasury Decision Retains Calcium Arsenate on Dutiable List

No Authority Under Tariff Act to Transfer It to Free List—Consumers Are Expected to Petition for Reduction in Duty

CALCIUM ARSENATE will remain on the dutiable list of the 1922 tariff act, there being no authority in the law to transfer it to the free list, according to a decision announced May 9 by McKenzie Moss, Assistant Secretary of the Treasury.

Southern Senators and Representatives and others acting in behalf of cotton planters who consume considerable quantities of calcium arsenate in combating the boll weevil had asked the Treasury Department to reverse its ruling that the commodity is dutiable at 25 per cent ad valorem as a chemical compound, under the basket clause of paragraph 5 of the new tariff. They pointed out that at the request of Southern Senators, white arsenic, the principal ingredient of calcium arsenate, had been put on the free list before the act was passed and that omission of specific mention of calcium arsenate obviously was an oversight.

Attorney-General Daugherty was asked for an opinion by Secretary Mellon. He replied that the matter was one for the Treasury to handle. After consideration, Assistant Secretary Moss decided that the decision holding calcium arsenate dutiable at 25 per cent must stand, as under the law all commodities not mentioned or described in the free list must be classified in the dutiable list, and there is no paragraph of the free list into which calcium arsenate might be read.

While the Treasury decision came as a disappointment to the petitioners for removal of duty, it is reported that plans are now being worked out to secure relief from the duty as now operative. It is probable that application will be made to the Tariff Commission, asking for a reduction in duty of the maximum amount of 50 per cent allowable under the flexible provisions of the tariff act.

Calendar

The following important technical meetings are scheduled for the immediate future:

SOCIETY OF CHEMICAL INDUSTRY Chemists' Club, New York City, May 18

AMER. SOCIETY MECHANICAL ENGRS. Montreal, May 28-31

CANADIAN INSTITUTE OF CHEMISTRY Toronto, May 29-31

SOCIETY OF CHEMICAL INDUSTRY Canadian Section Toronto, May 29-31

AMER. ASSN. CEREAL CHEMISTS Chicago, June 4-9

AMER. LEATHER CHEMISTS ASSN. White Sulphur Springs, W. Va., June 7-9

NAT'L FERTILIZER ASSOCIATION White Sulphur Springs, W. Va., June 11-16

NATIONAL LIME ASSOCIATION New York City, June 13-15

SOCIETY FOR STEEL TREATING Eastern Sectional Meeting Bethlehem, Pa., June 14-15

AMER. INST. CHEMICAL ENGRS. Wilmington, Del., June 20-23

AMER. SOC. FOR TESTING MATERIALS Atlantic City, June 25-29

Award to Grasselli Co.

Recovers Part of Losses for War-Time Operation of Pyrites Mine

An award of $44,244.05 to the Grasselli Chemical Co. has been recommended by the War Minerals Relief Commissioner. The recommendation covers a portion of the losses of that company in connection with the war-time operation of a pyrites mine at Mineral, Va.

Under former owners the property had been one of the largest producers of pyrites in the South. When the Grasselli company took it over, practically all of the ore had been removed from the old workings, which necessitated the deepening of the shaft and the opening of the ore bodies at lower levels. The Grasselli company paid $100,000 for the lease of the property and the option to purchase it on payment of a further $200,000.

Under the War Mineral Relief Commissioner's interpretation of the act, no part of the actual purchase is an allowable item. He holds, however, that the chemical company is entitled to a fair rental for the machinery and equipment in addition to the net operating loss.

Since the War Minerals Relief Commissioner must establish whether or not other war-time operations resulted in profit, an affidavit was secured from Charles M. Hicks, in charge of the ore department of the Grasselli company, to the effect that all of these mining operations were unprofitable. He stated that the company has made no claim for losses on other properties because the operations were undertaken without government stimulation.

Frank H. Rosengarten Dies

Frank H. Rosengarten, 80 years old, prominent as a chemist before his retirement from business in 1897, died on Monday, May 7, at his home 1905 Walnut St., Philadelphia, Pa., following an attack of heart disease. Mr. Rosengarten was a native of Philadelphia, being the son of the late George D. Rosengarten, founder of the firm of Rosengarten & Sons, manufacturing chemists. The Rosengarten firm in 1905 was consolidated with the firm of Powers & Weightman, becoming Powers, Weightman & Rosengarten. He was a member of the Union League. A sister, Miss Fannie Rosengarten, and two sons, J. Clifford and Samuel R., all of Philadelphia survive him. The funeral was private.

New York Chemists' Club Holds Annual Election

The New York Chemists' Club, meeting on May 2, was presented with 500 shares of the stock of the Chemists' Club Building Corporation. Dr. W. H. Nichols, the donor of this stock, which is valued at $25,000, was one of the charter members of the club. The annual election held on the same evening awarded the chairs for the coming year as follows: President, F. J. Metzger; resident vice-president, Allen Rogers; non-resident vice-president, E. R. Weidlein; treasurer, A. G. Robinson; secretary, Herbert G. Sidebottom; trustees, A. A. Holmes and Thomas R. Duggan. The latter was appointed to the place left vacant by the death of Stephen K. Reed, who died after his nomination had been announced.

Engineering Societies Will Investigate Coal Storage

Appointment of four members to conduct an investigation of the storage of coal is announced by the Federated American Engineering Societies. They are: P. F. Walker, dean of engineering, University of Kansas; S. W. Parr, professor of applied chemistry, University of Illinois; H. Foster Bain, director of the U. S. Bureau of Mines; L. E. Young, Union Light & Power Co., St. Louis. The chairman is W. L. Abbott, chief operating engineer of the Commonwealth Edison Co., Chicago.

A bibliography of the subject is already in course of preparation, as well as a compilation of data and records that have already been made by other organizations. Plans are being developed for securing additional original information which, when enlarged and approved by the committee at a meeting in May, will be put into operation immediately.

New Price Schedule for German Potash

The Potash Importing Corporation of America, which took over the sale and distribution of German potash, on May 1, has announced a new and lower price schedule, covering shipments from May to September. The new prices are on a basis of $34.55 for muriate 80-85 per cent; $43.67 for sulphate 90-95 per cent; $25.72 for double manure salt 48-53 per cent; $16.03 for manure salt, minimum 30 per cent; $10.55 for manure salt, minimum 20 per cent; $7.22 for kainit 12.4 per cent. These prices are per ton of 2,000 lb., net weight, c.i.f. Atlantic and Gulf ports. The prices are subject to discounts of: 1 per cent on purchases of 1,000 tons; 3 per cent on purchases of 3,000 tons; 4 per cent on purchases of 10,000 tons; 6 per cent on purchases of 15,000 tons; and 10 per cent on purchases of 20,000 tons.

Official Figures Verify Expansion In Export Trade for Chemicals

March Exports Valued at $2,500,000 in Excess of February Totals—Soda Compounds Figure Prominently in Outward Movement

CHEMICALS and allied products to the value of $11,857,049 were exported in March. This is an increase of $2,500,000 over the value of similar exports in February, and an increase of nearly $1,500,000 over the value of these exports in March of 1922. March exports of coal-tar products were valued at $1,133,815, as compared with $986,-545, the value of coal-tar products exported in February.

Sodas and sodium compounds to the extent of 35,329,636 lb. were exported in March, an increase of nearly 2,000,000 lb. over February and of nearly 4,000,-000 lb. over March of 1922.

Exports of pigments, paints and varnishes during March showed an increase of $500,000 over the export movement in February, with practically the same increase over those of March, 1922. The value of the exports of pigments, paints and varnishes in March of 1923 was $1,583,169.

Fertilizer exports contributed their part to the March increase. In that month these exports were valued at $1,715,186. This compares with $1,448,-804 in February, and $1,520,188 in March, 1922. Exports of sulphate of ammonia in March were valued at $959,-663. The increase over February, however, was in value rather than in tonnage. Exports, in the order of their importance, were to the following countries: Japan, Dutch East Indies, China, Phillippine Islands and Cuba. Spain, which was a large consumer in March, 1922, was the destination of no shipment of sulphate of ammonia in March of 1923.

There was a decided upturn in the amount of explosives exported in March. In that month 3,254,747 lb. was shipped out of the country, whereas in February the movement totaled 1,485,011 lb.

Some of the more striking contrasts in export movement during March, 1923, as compared with the corresponding month of 1922, are shown by the following figures compiled by the Department of Commerce:

	1922 Lb.	1923 Lb.
Aniline oils and salts	10,660	89,515
Misc. intermediates	22,033	153,198
Coal-tar dyes and stains	712,404	1,606,168
Sulphate of quinine	* 41,872	148,225
Sulphuric acid	1,003,128	702,355
Aluminum sulphate	1,788,040	2,396,408
Acetate of lime	2,541,897	1,964,833
Calcium carbide	1,106,905	442,531
Copper sulphate	915,482	153,346
Dextrine	926,398	2,099,563
Chlorate of potash	61,764	1,618,054
Bichromate of potash	648,086	1,033,857
Cyanide of soda	74,102	273,320
Borax	778,194	4,185,983
Caustic soda	18,612,225	9,855,416
Zinc oxide	535,442	1,622,912
Carbon and lamp black	2,364,444	1,696,174

* Ounces

Institute Holds Busy Zinc Meeting at St. Louis

The fifth annual convention of the Zinc Institute was held at St. Louis May 7 and 8. The technical addresses included one on "Zinc Oxide and Lithopone" by E. V. Peters of the New Jersey Zinc Co.; one on "Zinc" by C. H. J. Trench of the American Metal Market, and one on "Improvement of Milling Practices" by H. H. Wallower of the Golden Rod Smelting & Refining Corporation, Joplin, Mo.

H. H. Wallower was elected president for the coming year. A. P. Cobb, New Jersey Zinc Co., New York; J. G. Starr, Quinton Spelter Co., Joplin, Mo., and C. F. Kelley, Anaconda Copper Mining Co., New York, were elected vice-presidents.

H. I. Young, American Zinc, Lead & Smelting Co., Mascot, Tenn., was re-elected treasurer, and S. S. Tutthill, New York, was re-elected secretary.

Chicago Chemists' Club Elects New Officers

At the annual meeting of the Chicago Chemists Club, Tuesday evening, May 1, the following were elected officers: President, A. V. H. Mory; first vice-president, A. E. Shaar; second vice-president, H. G. Walker; secretary, R. C. Shuey; treasurer, O. H. Wurster; trustees, S. L. Redman and F. J. Root. Formal business concluded, the remainder of the evening was devoted to a lively round-table discussion of club plans and activities.

Johns Hopkins to Give Course in Gas Engineering

Various gas industries and public service corporations have guaranteed Johns Hopkins University $6,000 a year for 5 years for a chair in gas engineering. The donors are located in sixteen Southern states.

The principal purpose of the new courses will be to train graduate students in this special field. It is hoped that the development of these courses will include particular attention to research in the problems arising in the gas industry. The university is particularly well equipped for this work, as it has had for several years a laboratory for experiments in the recovery of the various byproducts of gas manufacture.

A 4-year undergraduate course in gas engineering will also be offered. During the first 3 years these courses will be closely related to the courses already existing in mechanical engineering and chemistry. During the fourth year principal attention will be given to training in the methods of gas manufacture and usage.

News Notes

Reparations dyes will not be sought by the United States before Congress again convenes. The State Department expains that this is due to lack of machinery for suitable distribution of such dyes should they be obtained.

A new calorizing company has been formed in Deleware to take over the Calorizing Company of Pittsburg. The latter concern has developed a commercial heat-treating process for surfacing iron, steel and other metals with aluminum.

"Nothing takes the place of leather" is the slogan of the Tanners' Council of America in launching its $1,250,000 campaign for the education of the American people in the uses of this commodity and in the status of the industry. Every modern means of gaining publicity is to be utilized.

Alabama's iron industry is picking up. The Sloss-Sheffield Steel & Iron Co. is to start fires in one of the Sheffield furnaces about June 15, according to a recent report, Belief exists at Sheffield that the Sloss company ultimately will erect a steel plant or rolling mills there. The new units which the company has acquired gives it an output of pig iron in this district of about 1,000 tons daily.

The Newark Technical School is to confer the degree of Bachelor of Science upon eleven graduates from the college of engineering at its first commencement on May 14. The event is of interest because chemical engineers are included in the first class to graduate from this school.

Picric acid export taxes during the war were properly levied, according to a decision handed down on May 3 by Federal Judge Learned Hand. The suit of American Synthetic Dyes, Inc., was thereby lost. A total sum of $15,000,-000 from this and from similar suits is said to be gained by the government by this decision.

Damage of $100,000 was done by fire in the plant of the United States Cast Iron Pipe & Foundry Co., at Scottdale, Pa., on May 2. A building filled with valuable patterns and which also included a molding floor was destroyed.

Face brick interests held a meeting on May 11 with the division of simplified practices of the Department of Commerce at Washington. At the conference the advisability and practicability of reducing the number of types and sizes of brick were discussed.

The Syracuse Section of the A.C.S., meeting at Barone Hall on April 27, elected as officers for the ensuing year: President, Ross A. Baker; vice-president, W. B. Hicks; secretary, J. H. Nair; treasurer, P. S. Craig; local councilor, A. W. Kimman.

The fall meeting program of the A.C.S. is already being planned by the various divisions. The meeting is to be held at Milwaukee Sept. 10 to 14.

Intersectional Meeting at Urbana Draws Large Attendance

Good-Fellowship Keynote at 2-Day Meeting of Mid-Western Chemists—Group Programs So Arranged as to Permit Ample Time for Presentation

CENTERING about the Chemistry Building at the University of Illinois, Friday and Saturday, May 4 and 5, there transpired a series of events which again serves to demonstrate beyond all doubt the value of intersectional meetings in the American Chemical Society. In response to an invitation from the Illinois Section, about 150 members representing ten other sections gathered at Urbana for 2 days of inspiration and good-fellowship. Including local members, the total attendance was well over 200, which indicates a most hearty interest in these meetings.

In welcoming the visiting chemists, Prof. W. A. Noyes outlined briefly the organization of the chemistry department at Urbana, indicating in a general way the character of the research work being conducted in the various departments. President E. C. Franklin outlined some of the fundamental facts concerning the ammonia system of compounds upon which his attention has centered for many years. Dr. L. F. Nickell, of the Monsanto Chemical Works, followed with a talk on the present needs of the organic chemical industry. Census figures for 1921 indicate an alarming drop in the production of many organic intermediates and finished products. Dr. Nickell attributed this to such factors as loss of export, duplication of effort through the production of the same commodity by too many firms, the employment of untrained chemists, failure to scrap obsolete equipment and processes. Until these conditions are rectified, development of the organic chemical industry will be hampered.

Time Found for Social Gathering

At the conclusion of the general meeting automobiles were in readiness to carry the party to the Urbana Country Club, where an exciting game of indoor baseball was soon in progress between teams representing Chicago-Illinois on the one hand and Indiana on the other. The final score stood 18 to 6 in favor of Chicago-Illinois. Returning indoors, a social hour before the open fireplace preceded the buffet supper. Then followed an informal talk by President Franklin, an amusing selection of home-grown poetry by Prof. W. Lee Lewis and entertainment by members of Alpha Chi Sigma, Iota Sigma Pi and Gamma Pi Upsilon fraternities.

Saturday morning's activities opened with a popular lecture by Dr. P. N. Leech, of the American Medical Association, on "Home Remedies — Their Claims Versus Composition." At 9:30 group meetings began, the programs presented being as follows: Physical and inorganic, 9 papers; industrial, 8; organic, 5; educational, 4. Some of the papers are given in abstract in the following paragraphs.

Industrial Group Meeting

Experiments on the combustion of hydrogen and carbon monoxide in the presence of various heated oxides were reported by M. J. Bradley, of the University of Illinois. Many oxides were tried either alone or with small amounts of other oxides as catalyzers, but the best results were obtained with copper oxide which was in process of being slightly reduced. Application of these findings in the developments of an improved apparatus for fuel gas analysis was discussed by F. E. Vandeveer, also of the University of Illinois.

As reported by Prof. C. W. Parmelee, investigations in progress in the ceramic department, University of Illinois, include the determination of the heat energy required to burn pure grades of clay to different temperatures, viscosity and surface tension of glass, a phase-rule study of the system Na_2O-CaO-SiO_2, translucency of porcelain by the use of a photo-electric cell.

Acid Car Construction Described

Expense of maintaining muriatic tank cars led the Monsanto Chemical Works to investigate methods for increasing the life, and a design which promises to solve the difficulty was described by Dr. L. F. Nickell. A tank is built up of 3⅝-in. fir staves and heads, the latter being reinforced with 4x6 yellow pine checkerwork. The inside is then treated with a coating of Positive Seal B asphalt cement, which is thoroughly ironed in. The wooden tank is then slipped into a steel tank car which allows 3 in. clearance on all sides. After filling the wooden tank with water to prevent softening of the cement, 160 deg. pitch is blown into the spare between the tank and the steel shell, completely filling it. With this construction, the inevitable acid spills corrode only the outside of the steel shell. A spare 4 ft. square immediately under the dome is bricked over in order to prevent penetration of the cement coating when iron measuring rods are used. The cars are emptied by siphoning out with rubber hose. They have been in service for some time with excellent results.

Dr. E. W. Engle discussed a new electrolytic rectifier using tantalum and lead electrodes in a sulphuric acid solution which has now been placed on the market as a result of investigations of the behavior of tantalum as an electrolytic valve.

A new development in the agreement whereby the Public Health Institute of Chicago maintains research fellowships on organic arsenic and mercury compounds at Northwestern University is the full-time employment by the institute of a chemist whose sole duty is to prepare for the research students intermediate products which are not obtainable in the market. This arrangement, which greatly increases the time devoted to pure research, was discussed by Prof. F. C. Whitmore.

Practical data on the construction of granular graphite resistor furnaces for temperatures up to 1,600 deg. C. were given by M. M. Austin, of the University of Illinois. The furnace must be easy to repack, and this should be done on every other heating. The incoming electrode must be pushed tightly against the graphite. Electrodes should be very rugged in construction in order to carry current up to 500 amp. without the necessity of water cooling, which is troublesome.

Frank P. Brock, of the Redmanol Chemical Products Co., concluded the program with some interesting reminiscences of the problems that attended the early attempts to place Redmanol on the market.

Steel Institute Announces May Program

On Friday, May 25, the twenty-third general meeting of the American Iron and Steel Institute is to be held in New York. The following papers are to be presented at the Hotel Commodore, where the Institute's headquarters are to be:

Address of the president, Elbert H. Gary, chairman, United States Steel Corporation, New York; "The Value of Chemistry in the Iron and Steel Industry," W. A. Forbes, United States Steel Corporation, New York; "Motor-Driven Rolling Mills," H. E. Davis, electrical engineer, Interstate Iron & Steel Co., South Chicago, Ill.; "The Standardization of Steel Mill Practice by Time Studies," Robert Gregg, president, Atlantic Steel Co., Atlanta, Ga.; "Gas Producer Practice in Steel Works," Waldemar Dyrssen, United States Steel Corporation, New York; "Methods in Waste Elimination," H. T. Morris, metallurgical engineer, Bethlehem Steel Corporation, Bethlehem, Pa.; "The Disintegration of Firebrick Linings in Blast Furnaces," C. E. Nesbitt and M. L. Bell, research engineers, Carnegie Steel Co., Pittsburgh, Pa.

Dye Strength Suggestions Close May 14

The time limit for the receipt of criticisms of its tentative list of standard dye strengths has been extended by the customs service until May 14.

Many requests for an extension of time have been received since May 7 was set as the last day suggestions might be received, with the result that this extension has been granted.

H. D. Ruhm Elected President of N. Y. Paint Club

Widely Known Chemical Expert Chosen to Direct Local Organization —Has Acquired Enviable Reputation in Engineering and Chemical Manufacturing Circles

HERMAN DAVID RUHM, who may boast of 29 years of civil, mining and chemical engineering experience, now heads the Paint, Oil and Varnish Club of New York. At the annual meeting, held on Thursday evening, May 10, at Delmonico's, the members were unanimous in electing Mr. Ruhm the thirty-sixth president of the club. The Paint, Oil and Varnish Club of New York is one of the most influential organizations in trade circles and a pioneer in promoting better relations and a spirit of co-operation among members of the industry. The club is affiliated with the National Paint, Oil and Varnish Association, whose membership includes 1,500 firms. Mr. Ruhm became associated with the New York club in 1916 and his rapid rise to highest honors is a tribute to his ability, pleasing personality and untiring efforts in behalf of the organization.

Mr. Ruhm is well known in the field of chemical engineering, yet, in a truly modest way, he said that he could not quite understand why a chemist should have been singled out to guide the club for the ensuing year. But in the course of an interview he was not at all backward in upholding his profession and pointed out that it is a grave error to differentiate between chemistry and industry. Perhaps it was just this thought that prompted the committee on nominations to select Mr. Ruhm to head the club.

He was born on June 6, 1871, at Nashville, Tenn. After receiving his preliminary education at Fogg High School, he entered Vanderbilt University of Nashville, and was graduated with the class of 1892.

Early in his business career he devoted some time to civil engineering and engaged in construction work for the Nashville & Western Railway Co. and the North Carolina & St. Louis Railway. Later, while a member of the firm of Ruhm & Wilson, engineers and surveyors, he assisted in the United States Government survey of the Cumberland River.

The development of the phosphate rock deposits at Mt. Pleasant and Centerville, Tenn., always has been one of the subjects uppermost in the mind of Mr. Ruhm and he has been identified with this industry since 1893. In the way of achievement in the chemical industry he holds the honor of being the first man to perfect a method of producing caustic potash in this country on a profitable basis as well as on a commercial scale. From 1909 to 1916 he was vice-president and general manager of the Niagara Alkali Co., Niagara Falls, N. Y. In 1916 he became associated with the Marden, Orth & Hastings Corporation as manager of the chemical department. Mr. Ruhm also was vice-president of the Calco Chemical Co., producing coal-tar products.

In 1920 Mr. Ruhm again went into business for himself as a broker and dealer in chemicals and consulting mining and chemical engineer. He is vice-president of the Ruhm Phosphate & Chemical Co.

A Southerner by birth, he has shown more than passing interest in the fight to exterminate the boll weevil and is working out a plan to combine calcium arsenate with calcium phosphate so that the distribution of the poison may be accomplished in a more economical way. He is the author of several brochures on the development of a potash industry in the United States.

Mr. Ruhm is a member of the American Chemical Society, New Jersey Chemical Society, American Institute of Mining Engineers, Drug and Chemical Club, Chemists' Club, American Association for the Advancement of Science, American Electrochemical Society, Beta Theta Pi Club, Englewood Golf Club and Columbia Yacht Club.

Mr. Ruhm, in conducting the affairs of the Paint Club for the coming year, will be assisted by Charles J. Roh, vice-president; H. G. Sidebottom, secretary, and G. H. Tomlinson, treasurer. The newly elected executive committee comprises E. V. Peters, chairman; A. G. Fairweather, R. W. Murray, H. G. Sidford, A. S. Somers and Frank Waldo. The arbitration committee will have G. W. Fortmeyer as chairman and will be rounded out by D. E. Breinig, J. B. Bouck, Jr., H. Gates and Eugene Merz.

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Herman David Ruhm

Other committees will be appointed later by President Ruhm.

At the meeting Thursday night delegates were selected to represent the local club at the thirty-sixth annual convention of the National Paint, Oil and Varnish Association, which will be held in Chicago next November. R. O. Walker, an ex-president of the local club, heads the delegates and eight other ex-presidents of the club are included among the delegates.

Lower Duties Asked for Linseed Oil, Cresylic Acid and Phenolic Resin

Tariff Commission Will Grant Hearings on These Commodities—Efforts to Place Calcium Arsenate on Free List Unsuccessful

RENEWING its consideration of applications for changes of duty under the flexible tariff section of the new law, the Tariff Commission has ordered inquiries into several chemicals and other commodities.

Among these investigations is one into linseed oil, paragraph 54, in which an application for a decrease in duty has been filed by the Bureau of Raw Materials for American Vegetable Oils and Fats Industries, representing paint, varnish and soap manufacturers. The duty under the 1922 act is 3.3 cents per pound, which compares with an equivalent of 2 cents per pound in the act of 1909 and 1⅞ cents per pound in the act of 1913. Not only is the duty higher than ever before but a withdraw on the cake residue from the crushed flaxseed is permitted when this product is exported, thus indirectly increasing the protection of linseed.

A reduction in duty on synthetic phenolic resin, a coal-tar product in paragraph 28, dutiable at 60 per cent ad valorem, American valuation, plus 7 cents per pound, or an increase in products made of this resin was asked by the National Importing Co., New York. Under the special act of 1916, the duty on this resin was 30 per cent, foreign valuation.

James F. Ballard, Inc., St. Louis, applied for a reduction in duty on phenol, a coal-tar intermediate in paragraph 27, dutiable at 55 per cent, American valuation, and 7 cents per pound. The duty in the act of 1916 was 15 per cent, foreign valuation.

A reduction in the duty on cresylic acid, in the same paragraph with phenol and with the same comparative duties, was asked by the Insecticide and Disinfectant Manufacturers' Association, New York.

Other Investigations Ordered

Investigations also have been ordered by the commission into smokers' articles made of synthetic phenolic resin, reduction asked by Kaufman Bros. & Bondy and others; briar wood pipes, equalization because of alleged unfair practices of foreign manufacturers asked by the Reiss-Premier Pipe Co.; taximeters, increase asked by the Pittsburgh Taximeter Co.; and print rollers, increase asked by the National Print Cutters' Association, Jersey City.

There has been persistent opposition to reopening tariff discussions on vegetable oils, but this has been directed more against the oils that enter into edible trades than against linseed oil. Last Monday a delegation headed by Thomas G. McLeod, Governor of South Carolina, filed with the President a protest against docketing an application that sought a reduction in the duties on vegetable oils. The President replied that filing petitions for modifications could not be prohibited, but he called attention to the fact that the Tariff Commission makes a preliminary survey to determine whether the facts warrant recommending a hearing. He also gave assurance that tariff modifications, either way, would be justified only on the most striking evidence of the necessity for such changes.

Calcium arsenate is another chemical on which tariff changes have been asked. It differs from most of the other materials under discussion, inasmuch as the flexible features of the tariff law have not been invoked, but rather an official ruling that it has not been specially provided for in the tariff and should be placed on the free list because it is an arsenic derivative and arsenic is duty free. According to Treasury decisions, calcium arsenate is classified as a chemical compound, not specially provided for, and is held to be dutiable at the rate of 25 per cent ad valorem.

Cotton growers in the South brought the question before Attorney-General Daugherty with the request that he hand down a decision on this question. Early last week the Attorney-General declined to pass on the matter and gave as an opinion that it was the duty of the Treasury Department to classify merchandise under the proper paragraphs of the tariff act.

To Record Coal-Tar Imports at Port of New York

The Chemical Division of the Department of Commerce has expanded its service at the port of New York so as to record imports of the coal-tar products covered in paragraph 27 and paragraph 28 of the tariff act. Paragraph 27 comprises a lengthy list of coal-tar intermediates and products, while paragraph 28 adds coal-tar colors, dyes or stains, together with numerous coal-tar chemicals.

Increased Call for Zinc Dust in South Africa

Reports from Johannesburg state that zinc dust is being used more extensively in the production of gold. The installation of Crowe and Merrill processes on two new mine extensions has been completed and other mines are expected to follow suit. It is found that nearly 0.1 lb. of zinc dust is used for each ton of ore milled, and when all the mines of the Transvaal and Southern Rhodesia are using zinc dust, they will consume about 2,000 tons of the latter annually.

To Establish Plant for Glass Making in Peru

A company has now been formed in Lima for the establishment of a glass factory, the machinery and plant for which will be purchased in the United States. It is purposed to turn out all types of coarse bottles for industrial purposes, as well as window and sheet glass. No attempt will be made to produce fine colored glasses or glasses for optical purposes. Tank furnaces will be employed heated by producer gas. A fine greenish glass can be turned out locally from sand, limestone or chalk and dry sodium carbonate. Of other materials used—marl, clay, barium sulphate and basaltic rock—many are readily obtainable. Wide-mouthed jars and bottles will be produced by machinery, but it is not expected that for some time to come the output will obviate importations from abroad.

Chemical Foundation Suit Adjourned Till June 4

Testimony of Badische Representative Held Under Advisement by Judge Morris in District Court

The government's suit against the Chemical Foundation, Inc., for the return of 4,700 patents has opened. Whether or not these patents, purchased for $250,000, shall be placed again in the hands of the Alien Property Custodian is the question to be decided.

At a hearing held May 8 by Judge Morris in the United States District Court in Wilmington, Del., Dr. Karl Holderman, head chemist and general manager of the Badische company, testified that the patents taken by the United States during the war were worth $17,000,000 to the German chemical industry. Mr. Kresel, attorney for the Chemical Foundation, stated that this estimate was made 10 years ago and that the patents are practically worthless now. Dr. Holderman admitted that he was one of "a community of interests" of German chemical and dyestuff manufacturers. Kresel contended that Holderman was not a competent witness because the Badische company was interested in another suit to recover the patents.

A motion to lay aside Holderman's testimony was taken under advisement by Judge Morris. June 4 was set for hearing arguments on the motion.

It will be remembered that of the 4,700 patents seized only about 8 per cent have been used. In most cases the only object in obtaining these patents in this country was to protect Germany's home industry. For that reason the key step in various procedures was ordinarily left out of the American patent. Of the patents involved, those concerning manufacture of Salversan, of ammonia by the Haber process, of synthetic tanning materials and of various dyestuffs and pharmaceuticals are of considerable importance.

Fertilizer Merger Is in Sight

A number of small but important companies in the fertilizer trade are negotiating a merger. The total capitalization involved amounts to approximately $50,000,000. John J. Watson, Jr., vice-president of the International Agricultural Corporation, which, with the Davison Chemical Co., is expected to form the nucleus of the consolidation, said recently that plans for bringing other companies into the combination are being discussed in the belief that present conditions in the industry afford an excellent opportunity to bring them together under one management.

It was stated that neither the American Agricultural Chemical Co. nor the Virginia-Carolina Chemical Co. will be included in the projected amalgamation. The independents named as likely to enter the merger along with International Agricultural and Davison Chemical are the Phosphate Mining Co., the Standard Acid Phospate Co., of Baltimore; the Federal Chemical Co., Louisville, and the Reed interests, of that city. It is also reported in the financial district that the fertilizer department of Swift & Co. has been approached.

Stabilization the Object

The purpose of the proposed merger, according to the promoters, is to stabilize the fertilizer industry, which, despite prosperity in other lines of business, is not operating on a profitable basis. This has been reflected in recent weakness of the securities of the fertilizer companies. It is believed that a combination of producers of raw materials, including phosphates with mixers, would cut overhead and make for steady prices in a market that is now extremely irregular. Competition among the independent mixers, particularly in Baltimore, has been an unsettling factor in the fertilizer situation for some time.

The International Agricultural Chemical Corporation owns extensive deposits of phosphate rock in Florida, while the Davison Chemical Co. is an important producer of sulphuric acid.

Use of Gas Increasing

Contrary to the belief of many, the gas industry is growing steadily and at quite a rapid rate. Facts of national interest appear in a recent report of the New York State Committee on Public Utility Information.

"While use of gas for illumination has gradually decreased, amounting to only 20 per cent of the total production in 1921," it states, "the advantages of gas over coal for cooking, house heating and numerous industrial processes have brought demands which are causing utility companies to operate their plants at capacity a considerable part of each year and to build larger ones in many cities.

"Reports to the Census Bureau give the total value of products of gas plants as $411,195,500 for that year, as compared with $329,278,000 for 1919, and $220,237,700 for 1914, an increase of 25 per cent from 1919 to 1921, and of 87 per cent for the 7-year period, 1914 to 1921.

"The total production of manufactured gas for 1921 was more than 326,000,000,000 cu.ft., of which the companies of New York State produced more than 100,000,000,000 cu.ft., or nearly one-third.

"Total sales of manufactured gas for 1922 by the entire industry are estimated by engineers of the industry at $450,000,000, with a production of about 375,000,000,000 cu.ft. The increased efficiency of the industry is indicated both by the larger yearly output and the decreasing number of wage earners required to make it."

Financial Notes

Devoe & Raynolds Co., Inc., has listed an issue of $2,000,000 first preferred stock of the company for trading in the New York Stock Exchange.

Fluctuations in the stock of the Mathieson Alkali Works have directed attention to the operations and unofficial reports say the company's earnings are on a basis of approximately $10 per share. Dividends on the common are not looked for this year.

The Eastman Kodak Co. has declared its regular quarterly dividend of $1.25 per share and, in addition, an extra dividend of 75c. per share.

In a report to stockholders, H. B. Thompson, president of the United States Finishing Co., said: "We closed our year with more goods on order than we have had since 1920, and the outlook for the coming year is favorable. Our printing business, which has on the whole been subnormal for the past 2 years, indicates a revival, particularly in dress fabrics."

The Diamond Match Co. is reported to have made arrangements to retire, on Nov. 1, the outstanding $5,735,200 15-year 7½ per cent debentures, due 1935. The retirement price is given as 105.

Ceramic Laboratory Proposed

At the recent annual meeting of the United States Potters' Association at New York, F. P. Judge, president of the association during the past year, urged that the organization give serious consideration to the establishment of a ceramic-chemical laboratory. Such an institution would be designed for the benefit of members who do not employ ceramic engineers or chemists. It would be primarily for the manufacturers of general ware and would be utilized for the most part for the solution of problems arising in this branch of production. It is purposed to give attention to the recommendation and to work for the establishment of the laboratory.

Trade Notes

Further reductions have been made in export tax on copra from Fiji. The rate is now 5s. per ton or fraction thereof.

The Federal Trade Commission has given Dings & Schuster of Long Island City 30 days to file an answer to charges of misbranding certain of its products. The commission charges that the respondent has placed upon the market two brands of shellac, the first composed solely of shellac gum dissolved in alcohol, while the second is made up of shellac gum and substitutes and is marketed with no qualifying words to indicate that the product is made of other than pure shellac gum.

The steamship "Kongosan Maru" arrived at San Francisco on May 7, from Dairen, with 500 bbl. soya bean oil, 1,125 cs. camphor, 50cs. menthol, 470 bbl. perilla oil and 3,058 bg. linseed.

C. M. Struven, of C. M. Struven & Co., Baltimore, dealers in fertilizer materials, was in New York last week.

An American Chamber of Commerce has been formed at Port-au-Prince, Haiti. There are 98 charter members, and an active campaign is planned to develop commercial relations between Haiti and the United States.

J. F. Wischhusen, manager of the Superfos Co. of New York City has gone to Europe in the interests of his company. Mr. Wischhusen will visit central European countries as well as northern Europe and plans to be away about 10 weeks.

Joseph Guerin, president of the Guerin Mills, died at his home in Woonsocket, R. I., on May 6. He controlled seven large yarn, worsted weaving and dyeing plants, capitalized at $7,000,000.

The Northern Chemical Works of Chicago has filed application calling for the dissolution of that company.

Hoskinson Gates, who for the past 13 years has been associated with the Eagle Picher Lead Co., has severed his connection with that company. Mr. Gates is a former president of the Paint, Oil and Varnish Club of New York.

M. Winter has been elected president of the Texdel Chemical Co. He succeeds J. M. Marshall. The plant of the company has been moved to Nutley, N. J.

Eugene Suter, head of Eugene Suter & Co. of New York, left for Europe on Saturday.

Albert J. Berwin has been appointed receiver for the Jacksonville Chemical Co. of 246 Water St., New York. The liabilities of the company are placed at $35,000 and assets at about $10,000.

On May 1 the Potash Importing Corporation formally entered the potash field by taking over the marketing and distributing business, in this country and Canada, of the German Potash Syndicate.

Facts and Figures That Influence Trade in Chemical Products

Market Conditions

Current Prices Imports and Exports The Trend of Business

Slowing Up in Demand Creates Easier Feeling in Market for Chemicals

Lower Prices Established for German Muriate of Potash—Shipment Prices Over Next Year Announced for Nitrate of Soda—Arsenic Sells at Lower Prices—Permanganate of Potash Weak—Bichromates Higher

CONSUMING demand for chemicals has reached the stage where many sellers describe the market as slow. Call for contract deliveries is holding up well and this is accounting for a good part of the domestic output. New business, however, has fallen off in volume and this fact, combined with competition from foreign offerings, is giving an easy tone to many materials in the chemical list.

Exchange Weakens Foreign Markets

Declines in exchange has had some effect in lowering values for many chemicals of foreign origin. This has been manifest more by causing importers to hold off placing orders, rather than in drastic price changes for imported goods, but the effect is noticeable in opinions widely held that selling pressure will arise in foreign centers, which in turn will bring about price concessions. In some cases imported goods held in the spot market have been pressed for sale, in an effort to bring buyers into the market. Among the items so affected may be mentioned permanganate of potash, hyposulphite of soda, prussiate of soda and prussiate of potash.

New Contract Prices

New price schedules were announced during the week on important materials. The Nitrate Association in Chile made public its quotations on nitrate of soda, covering shipments for the year from July to June. These prices had been generally anticipated and were about in line with the quotations which importers had been making recently. The sales agents for German potash producers also announced a new price schedule for potash salts. The revised prices showed a decline as compared with the prevailing quotations but suffer somewhat with the prices which have prevailed in recent transactions in the local market.

Higher Producing Costs

Domestic producers of bichromates advanced prices in the preceding week and followed this with another rise in quotations last week. Higher producing costs was given as the explanation for the advances. Similar conditions are reported in the case of caustic potash, oxalic acid, acetic acid, acetate of lime, and numerous other commodities, so that it may be said that weakness in price is evident largely in the case of chemicals where a good part of domestic requirements are filled by imported manufactures.

The metal markets were lower during the period, but this was not followed closely by the metal salts, although some of the latter may be revised downward unless the metals show immediate signs of recovery.

Acids

Acetic Acid—There has been no further change in acetate of lime and acid producers who use the latter have had no occasion to change their asking prices. The lower grades of acetic acid are finding less competition than the higher grades and are firm at 3.38c. per lb. for 28 per cent, with corresponding increases based on quantity and package. For 56 per cent the quotation for round lots is 6.75c. per lb. Glacial shows more of a range according to seller, with 12c. per lb. as an inside figure, although most producers are quoting above that price.

Boric Acid—The tone to prices remains easy and consuming demand has not been stimulated to any extent by the recent reduction in price. Round lots in bbl. are offered at 10½c. per lb.

Citric Acid — Domestic makers are pretty well sold ahead and while they are holding prices on an unchanged basis of 40@50c. per lb., the quotation is little better than nominal in some quarters. Imported has been meeting with an improved call and prices show a tendency to stiffen, with 52c. per lb. generally quoted for spot or shipment.

Formic Acid—Arrivals of imported material reached the local market during the week but offerings for nearby shipment are not free and predictions of higher prices are heard, especially if buying becomes more active. Imported on spot was held at 14¾@15c. per lb. Domestic is unchanged at 16c. per lb. and upwards according to quantity.

Oxalic Acid—Increasing costs of production are given as the reason for higher prices for domestic oxalic and the best price heard is 13½c. per lb., f.o.b. works. Imported oxalic was in poor demand throughout the week and holders were open to bids with the result that 13¼c. per lb. could be worked by buyers.

Tartaric Acid—The advance as announced last week has been well maintained in the case of domestic made goods and 37½c. per lb. is asked for powdered and crystals. Imported was higher this week and cables received were on a basis of 37c. per lb., duty paid.

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	177.69
Last week	179.28
May, 1918	270.00
May, 1919	248.00
May, 1920 (high)	280.00
May, 1921 (low)	143.00
May, 1922	159.00

Weakness in linseed oil, cottonseed oil, and chemically pure glycerine caused a downward revision in the week's index number of 159 points.

Potashes

Bichromate of Potash—Prices were again higher and in some directions 11¼c. per lb., works, was held as an inside price. It was possible, however, to do 11⅛c. per lb. Increased cost of manufacture is given as an explanation of the stronger position of the market.

Caustic Potash—The market presents an unusual appearance, inasmuch as goods of domestic manufacture are firmly held and 9c. per lb. and upwards is asked at the works. Sellers say the higher prices are rendered necessary by increased cost of operating. Imported caustic is decidedly easy. Goods afloat were offered late in the week at 8c. per lb., but in the spot market there were offerings as low as 7⅝c. per lb. The weakness in imported material serves to detract from the strength in domestic.

Carbonate of Potash—The feature in this market is the fact that there are spot offerings of 90-95 per cent at 6½c. per lb., whereas 80-85 per cent is generally held at 7c. per lb. For the 96-98 per cent there were sellers at 7½c. per lb. Inquiry is more active for the 80-85 per cent than for the other selections.

Chlorate of Potash—Sales of imported chlorate were made at 7½c. per lb. and on firm bids it was reported that this price could be done at the close. The general asking price, however, was higher, with 7¾c. per lb. generally held as the open quotation. There was no revision in prices for domestic, and

sellers continued to ask 8½c. per lb., works, for round lots, with the usual premiums for smaller lots.

Muriate of Potash—On Wednesday a new price list covering German potashes was issued. Muriate 80-85 per cent is quoted at $34.55 per short ton, in 200-lb. bags, f.o.b. Atlantic ports. This price is subject to discounts, varying according to the amounts purchased. Alsatian muriate is offered rather freely and the market is largely a matter of private terms, with sales reported under the level quoted for German.

Permanganate of Potash — Demand has not been heavy enough to hold prices on a steady basis. Advices from primary points say that no material changes have taken place but it is thought that selling pressure will appear at any time and some well posted members of the trade say the drop in values will become more pronounced unless buying orders come to hand in sufficient volume to uphold the market. On spot permanganate is held at 21c. per lb., but this is not a firm price. Shipments are freely offered at 20c. per lb. but are not attracting attention. About a month ago shipments sold at 18½c. per lb. and buyers are looking for values to drop back to that level.

Prussiate of Potash — Yellow prussiate was a little easier with sellers openly offering at 36½c. per lb. Demand is slow and this adds to the general weak appearance of the market. Red prussiate was still available at 70c. per lb., although there is considerable range for the latter according to seller.

Sodas

Bichromate of Soda—There were spot offerings at 8¼@8½c. per lb., with sales at the inside figure. The market, however, was higher, with first hands marking up quotations to 8½c. per lb., carlots, at the works. Competition among producers is not keen and the absence of selling pressure combined with higher production costs has established the market on a higher price level.

Caustic Soda — Export buying was again of smaller proportions and this gave an easy tone to f.a.s. quotations. Outside brands were offered at 3.30c. per lb., f.a.s., and standard makes were quoted at 3.40@3.45c. per lb. A report from Brazil, which has been a prominent buyer of caustic, states that the market there is dull. The report further states that the caustic soda war has been ended, and the leading British and American exporters have agreed that prices are not to drop below 0.950 milreis per kilo. In the domestic trade prices are holding at 2½c. per lb., carlots, works, basis 60 per cent.

Chlorate of Soda—Imported chlorate is meeting with a slow call from consumers but this is offset by firm markets abroad and also by the fact that spot holdings have been reduced. Prices are generally given at 6¾c. per lb., but it is probable that 6½c. per lb. could be done. Some offerings of inferior grade have been on the market and this has made buyers cautious. Domestic chlorate is firmly held at 6½@7c. per lb., works, with a seasonable movement to consumers.

Cyanide of Soda — A very routine market is reported. Arrivals of imported are noted, with prices for the latter ranging from 20c. to 22½c. per lb., according to grade and sellers. Domestic cyanide is moving fairly well, but trading is not active and prices are stationary at 19½c. per lb. and upwards on a quantity basis.

Nitrate of Soda—A graded scale of prices for the coming year was made operative during the week. These prices were fixed by producers in Chile and are as follows, the quotations referring to metric quintals: July, 19s. 8d.; first half of August, 18s. 5d.; second half of August, 19s. 7d.; first half of September, 19s. 9d.; second half of September, 19s. 11d.; first half of October, £1 3d.; second half of October, £1 3d.; first half of November, £1 5d.; second half of November, £1 7d.; first half of December, £1 9d.; second half of December, £1 11d.; Jan. 1-June 15, £1 1s.; second half of June, 19s. 3d.

These prices work out at a range of $2.47½ to $2.60 per 100 lb. for Atlantic coast ports and are about in line with what the trade had expected.

Prussiate of Soda—Domestic producers are holding values steady at 17½c. per lb. There is some competition from imported material and sales of the latter were reported at 17¼c. per lb. There also were offerings of imported for shipment at 17¼c. per lb. Buying is not active either in domestic or foreign.

Miscellaneous

Acetate of Lime—Producers still complain of high producing costs and report that the market is well maintained at the higher price level as recently announced. Quotations are 4@4.05c. per lb. for acetate.

Arsenic—Domestic producers have sold large amounts for nearby shipment at 12½c. per lb. They also have sold smaller amounts for immediate shipment at prices ranging from 13½c. to 14½c. per lb. On deliveries over the second half of the year they quote 11c. per lb. In the open market prices were generally held at 15c. per lb. with spot sales reported at that figure. Prompt shipment from Canada was offered at 14¾c. per lb. Heavy arrivals from Japan were noted during the period and some of this material was sold ex-dock with prices irregular, although it is admitted that there were offerings as low as 14¾c. per lb.

Copper Sulphate—It was reported that distressed imported material sold at concessions early last week. Towards the close, however, prices showed no important change contrasted with those of a week ago. Imported was offered at 5½c., all positions. A cable from Hamburg quoted 11¾c. per kilo on copper sulphate. Domestic producers took little note of the increased competition with the foreign goods and prices were maintained at 6@6½c. per lb., according to the seller, etc.

Cream of Tartar—The advance in tartaric acid has had no influence on cream of tartar. Producers still quote 26½c. per lb. Imported grades are offered at 26@26½c. per lb. with a rather firm tone to cables from producing centers.

Formaldehyde—While some scattered lots might have been picked up at 14¾c., most traders refused to shade 15c., the price demanded in producing circles. Demand was routine only, but prices reflected a steady situation in raw materials.

Glaubers Salt—Buyers have been showing very little interest in the market and prices are unsteady. The nominal quotation is $1 per 100 lb. for imported offerings, but this price is decidedly weak and according to reports it was possible to do 85c. per 100 lb.

Lead Acetate—The sharp decline in pig lead offset the strength in the other basic materials and talk of a higher market seems to have vanished. Demand was up to normal for this season of the year. Leading producers continued to quote the white crystals at 13½c. per lb., in barrels. On the brown, broken, in casks, 12½c. was asked.

Sal Ammoniac—Importers continued to quote on the basis of 7c. per lb., but admitted that some material changed hands around 6¾c. The foreign markets underwent little change. Cable advices from Hamburg quoted 11c. per kilo. The duty on this commodity is 1½c. per lb.

Tin Oxide—There was an irregular market for the metal, but net changes for the week were not important enough to bring out a revision in the prices for tin oxide. Demand was limited all week, yet leading factors held out for 50c. per lb.

Alcohol Steady

Offerings of denatured alcohol were not pressing on the market and while business could not be called active, prices generally closed steady. Producers offered the No. 1 special at 33c. per gal. in drums, or at 39c. per gal. in barrels. The completely denatured, 188 proof, No. 1, held at 41c. per gal., in drums. Ethyl spirits, U. S. P., 190 proof, was available at $4.70 per gal., cooperage basis. Methanol was unchanged at $1.18 per gal. for the 95 per cent and $1.20 per gal. for the 97 per cent grade.

Canada Increases Exports of Calcium Carbide

A report from the Dominion Bureau of Statistics at Ottawa, Canada, states that there has been an important increase in exports of calcium carbide from Canada. During March outward shipments amounted to 59,994 cwt. (112 lb.), valued at $250,583.

Coal-Tar Products

Heavy Imports of Crude Naphthalene—Market Abroad Barely Steady—Spot Phenol Nominal at 55c.—Cresylic Acid Unsettled

THE movement of naphthalene into this country from foreign sources has taken on larger proportions, and this has served to take the edge off the market. Some traders even reported a slightly easier import basis for the crude. Cresylic acid was unsettled at the close and lower prices were named on scattered lots of foreign material. The decline in exchange had some influence on the situation. The announcement from Washington that the Tariff Commission has ordered an investigation into the phenol, cresylic acid and phenol resin situation led many to believe that the rates of duty on these commodities will ultimately be lowered. It is understood in trade circles that domestic producers of cresylic acid will offer no objections to a reasonable reduction in the existing tariff rates. Salicylic acid presented a firmer appearance, reflecting the strength in basic materials, but first-hands maintained prices at former levels. Demand for salicylic was routine only.

Benzene was in better request, the movement into channels situated outside of the motor fuel field improving steadily, the prices for the pure closing firm in all directions. The decline in gasoline should have little or no influence upon the benzene situation, according to producers. The output of solvent naphtha is moderate and a tight situation is reported, yet prices are not likely to change. Xylene, pure, is in a strong position because of the limited output. Demand for benzyl chloride is fair and consumers are now interested in offerings for shipment, notwithstanding the recent uplift in prices. Beta-naphthol is barely steady. Aniline oil is nominally unchanged.

Benzene — Intermediate makers showed more buying interest, and some traders reported a fair volume of orders. The demand from motor fuel quarters also picked up a little. The drop in gasoline prices had no influence upon the situation. The 90 per cent grade, held at 27@30c. per gal. in tanks or drums f.o.b. works. For the pure prices ranged from 30@33c. per gal., as to quantity and style of container.

Aniline Oil—A steady undertone featured the market and small lots changed hands on the basis of 16½c. per lb., immediate delivery. On round-lot transactions it would have been possible to do 16c. per lb., prompt and nearby delivery.

Cresylic Acid—The spot market on imported material was unsettled toward the close. Demand was routine only and there was more disposition to offer this material. The offerings from the other side were freer. Closing quotations ranged from $1.20@$1.35 per gal., as to quality, etc. Domestic makers reported a sold-up condition, with prices wholly nominal.

Beta-Naphthol — The market was barely steady, with sellers at 22½@23½c. per lb., immediate delivery. Producers, as a rule, held out for 23@23½c., the price depending upon the quantity.

Benzyl Chloride—No further price changes were made. First hands offered July shipment benzyl chloride on the basis of 45c. per lb., 95 to 97 per cent refined.

Naphthalene—Sales of flake on spot went through at 9c. per lb. For the ball the market settled at 9½@9¾c. per lb., some traders reporting business at the outside figure. The demand was good early in the week, but slackened later. The importations of crude were quite heavy and with cables no longer so firm offerings here increased. Nominal import prices on crude for shipment ranged from 3@3½c. per lb., as melting point.

Phenol — Scattered lots of U.S.P. phenol sold on spot at 55c. per lb., indicating that the market underwent scarcely any change. There was a fair inquiry for spot as well as nearby material, but the ideas of buyers were a shade under the market. The prospects for a larger supply in the near future made buyers cautious.

H-Acid—Offerings were moderate because of the restricted output, and prices held at 85@90c. for spot goods. On shipment business 80c. might have been done.

Salicylic Acid—The demand again was quiet, but prices ruled firm in all directions. Leading makers quote 47@48c. per lb. as the firm trading basis on the technical variety.

Xylene—The spot market for the pure was wholly nominal and second hands said that $1 per gal would have to be paid for outside lots. Producers have been taking on contract business in the pure at 75c. per gal.

Extend Time for Filing Export Licenses for Ruhr Trade

Unofficial advices have reached the National Council of American Importers & Traders that the time limit for filing export licenses covering shipments from the occupied sections of Germany would be extended. The recent ruling in regulations governing foreign trade with these sections of Germany was that foreign buyers, at their option, were authorized to apply for export licenses antedating Feb. 10, 1923, such applications to be filed not later than May 10. Those securing these licenses will be called upon to pay only such duties as were in effect at the time the order was placed.

Urges Rubber Growing in Philippine Islands

Harvey S. Firestone, president of the Firestone Rubber Co., in an address last Wednesday before the Chamber of Commerce of the United States urged American rubber manufacturers to take some action to bring about better conditions in the rubber industry. He stated that the Philippines offer natural advantages for growing rubber. He referred to a recent statement made by Pedro Guevara, Resident Commissioner of the Philippines, who declared that the islands have the greatest possibility in the world for the successful production of rubber.

Freight Rates on Barytes Held Unreasonable

Freight rates on barytes in carloads from Evington, Va., to South Charleston, W. Va., in the opinion of Interstate Commerce Commission Examiner Paul O. Carter, were unreasonable during a portion of 1919 and he has recommended that the carriers reimburse the Rollin Chemical Corporation for all freight charges collected to the extent that they exceeded $2.50 per ton.

Latest Quotations on Industrial Stocks

	Last Week	This Week
Air Reduction	66½	67
Allied Chem. & Dye	69¾	69½
Allied Chem. & Dye, pfd	109¾	110¼
Am. Ag. Chem.	25⅛	25
Am. Ag. Chem., pfd	47	46½
American Cotton Oil	12	12½
American Cotton Oil, pfd	24½	25½
Am. Drug Synd	5⅝	5⅜
Am. Linseed Co.	29	28⅜
Am. Linseed Co., pfd	52	48
Am. Smelting & Refining	59⅜	60⅜
Am. Smelting & Refining, pfd	98⅜	98⅞
Archer-Daniels Mid. Co., w.i.	39	39
Atlas Powder	173	175
Atlas Powder, pfd	87½	87½
Casein Co. of Am.	*60	*60
Certain-Teed Products	44	39
Commercial Solvents A	29	28
Corn Products	128½	131¼
Corn Products, pfd	117¾	117¾
Davison Chem.	27	27¾
Dow Chem.	40½	40½
Du Pont de Nemours	140	140
Du Pont de Nemours, db	88	87½
Freeport-Texas Sulphur	15⅞	15⅜
Glidden Co.	9⅝	9
Grasselli Chem.	130	130
Grasselli Chem., pfd	105	102
Hercules Powder	*107	*107
Hercules Powder, pfd	*103½	*102½
Heyden Chem.	1¾	1⅞
Int'l Ag. Chem. Co	*7	7
Int'l Ag. Chem. Co., pfd	*29	29
Int'l Nickel	13½	14½
Int'l Nickel, pfd	76½	78
Int'l Salt	*90	*90
Mathieson Alkali	49¾	49¼
Merck & Co.	85¼	86
National Lead	122	122½
National Lead, pfd	112¼	112½
New Jersey Zinc	172	165
Parke, Davis & Co.	79½	79½
Pennsylvania Salt	92⅝	92½
Procter & Gamble	*140	*140
Sherwin-Williams	*29¾	*29⅞
Sherwin-Williams, pfd	*102	*101
Tenn. Copper & Chem.	10⅝	10½
Union Carbide	61	61
United Drug	80	80½
U. S. Ind. Alcohol	57	58½
Va.-Car. Chem. Co.	13⅜	13½
Va.-Car. Chem. Co., pfd	38½	39½

*Nominal. Other quotations based on last sale.

Vegetable Oils and Fats

Lower Prices Named for Linseed, Cottonseed, Coconut, Corn and Palm Oils—China Wood Weak—Tallow 8c.

WITH no improvement in demand and general weakness in outside speculative commodity markets the tendency of prices again was downward. Prospects for ample stocks of flaxseed brought out an easier feeling in futures in the linseed oil trade and large consumers refused to take hold. Cottonseed was subjected to pressure on the decline in lard. Coconut oil was available at lower prices both here and on the Pacific coast. Corn and sesame oils were easier in sympathy with cottonseed oil, while the decline in palm oils could be traced to the weakness in tallow. Late in the week extra tallow sold down to 8c. delivered. Fish oils were neglected.

Linseed—Crushers announced a 3c. reduction in spot prices, establishing the carload quotation at $1.14 per gal., cooperage included. June delivery oil was revised to $1.12 per gal. while on July forward nominal quotations ranged from $1.03@$1.05 per gal., carload lots, cooperage basis. In the absence of any important buying futures were regarded as wholly nominal, especially in view of the fact that the prevailing price for October seed in the Duluth market permits of the production of oil at approximately 90c. per gal., based on a fairly low price for the cake. Buenos Aires quoted June shipment seed (option market) at $1.93 per bushel, a decline of almost 10c. for the week. The Argentine shipments since January 1, 1923, have reached a total of more than 28,000,000 bushels, a record quantity for 4 months. Argentine shipments to the United States since the first of the year amounted to 12,500,000 bushels. Receipts of domestic seed at Minneapolis and Duluth from September 1, 1922, to date amounted to approximately 8,200,000 bushels. With indications of a larger acreage in the United States and freer offerings from Argentina as well as India, traders seem to favor the bear side, notwithstanding the liberal increase in domestic consumption of linseed oil. Imported oil was neglected and "distressed" material sold on spot at less than $1.00 per gal. Foreign markets were lower, while easier exchange also was a market factor.

Cottonseed—Weakness in grains and lard had a depressing influence on the option market on the Produce Exchange and prices were irregular nearly all week. For a time the May position steadied on reports that a short interest was about to come in, but subsequent pressure from local bears made quite an impression on the list. The liberal hog movement surprised the longs. Cash trade in cottonseed oil and its products was routine only. The drop in tallow was a market factor. Crude cottonseed sold at 9¾c. per lb., sellers' tanks, f.o.b. mills Texas. A round-lot of bleachable was disposed of on the basis of 10¼c., Texas common points, with rumors of one transaction as low as 10c. per lb. New crop offerings of crude could not be located, but an easy feeling prevails on prospects for a 10 per cent increase in the cotton acreage. Lard compound was lowered to the extent of ½c. per lb., establishing the carload trading basis at 13@13¼c. Prime summer yellow on spot, in barrels, settled at 11⅞@12½c. per lb.. Lard in the Chicago market was easy around 10⅝c., May option.

China Wood Oil—Several bulk shipments of China wood oil arrived at New York last week. The spot market was easier on resale offerings and it would have been possible to shade 35c. On nearby oil there were sellers at 32@34½c. per lb. On the Pacific coast there were offerings of June-July oil at 25c., tank car basis. Prices were considered too high by varnish makers and no important buying took place.

Coconut Oil—Prices weakened in all quarters until the market reached 8½c. asked, coast, and 8⅞@9c. per lb., New York, basis sellers' tanks. The decline of ¾c. failed to arouse buying interest and at the close prices were little more than nominal. Copra was offered at 5½c., c.i.f. New York, shipment from Manila.

Corn Oil—Crude corn oil sold at 10c., sellers' tanks, f.o.b. point of production in the middle west, a decline of ½c. for the week.

Palm Oil—No buying interest was shown in futures and another drop in tallow brought out an easier feeling. Lagos for shipment from abroad, May-June, closed at 7⅞@8c. per lb. Niger for shipment was offered at 7⅝c. per lb., with no buyers.

Sesame Oil—Spot oil, refined, was lowered to 11⅞@12c. per lb., cooperage basis, without arousing any business of consequence. On forward shipments the market settled at 11¾c., c.i.f. New York.

Soya Bean Oil—The coast market was easier, May-June-July closing at 10¼@10⅜c. per lb., sellers' tanks, duty paid. Demand was quiet. The output of soya beans in Manchuria is estimated at 89,000,000 bushels, a normal crop.

Fish Oils—The market for crude menhaden futures was a dull affair, reflecting unsettlement in competing oils and facts. The producers continued to name 50c. as the nominal quotation, tank car basis, f.o.b. factory. Newfoundland cod oil was nominally unchanged at 70c. per gal., in barrels, spot New York.

Tallow and Greases—The sale of 5 cars of extra special tallow was reported at 8c. per lb., delivered, a decline of ½c. in less than 10 days. City special settled nominally at 7¾c. At the weekly London auction 1,560 casks were offered and 554 casks were sold at a decline of 6 pence. Yellow grease in the local trade was lowered to 7¾c. Oleo stearine closed at 10¼c. asked. No. 1 oleo oil was quiet at 14¼c. per lb.

Miscellaneous Materials

Casein—Importations continued at a healthy rate and with domestic offerings on the increase the market presented an unsettled appearance. Leading domestic producers offered the technical grades at 22½@25c. per lb. Demand was described as fair.

Glycerine — Refiners established the market for chemically pure glycerine at 17½c. per lb. in drums, carload lots, a decline of ½c. from the nominal quotation of a week ago. There was some misunderstanding in connection with the price during the week, as an outside party came out with a quotation of 17c. The 17c. basis was not recognized by leaders in the trade. In some directions it was said that quite a number of contract orders went through. Chicago quoted c.p. at 17½c. per lb. in drums, carload lots. Dynamite settled at 16½c. per lb. in drums, carload lots, f.o.b. point of production, but trading continued quiet. Crude soap-lye, basis 80 per cent, loose, held at 11@11¼c. per lb., New York territory. One car was traded in early last week at 10⅝c. Saponification, 88 per cent, held at 12½c., loose, with no sales.

Shellac — Sentiment generally was bearish and with trading inactive prices at the close were more or less nominal. T. N. on spot closed at 64@66c., as to quantity and seller. Superfine orange was offered at 70c. on spot and 68c. for shipment. Bleached, bonedry, closed at 78@80c. per lb.

Naval Stores—Another sharp downward revision in prices occurred in the market for turpentine, which, naturally enough, did not encourage buyers to take hold. Spirits of turpentine settled at $1.08@$1.10 per gal., a drop of 20c. per gal. in one week. The new crop offerings increased in all directions. Rosins also went off, registering declines of 10@15c. per bbl.

Lithopone—With no change in the barytes situation the market held on a fairly steady basis. The arrival of 1,580 casks of lithopone from Antwerp was reported here last week. Domestic makers quote 7@7¼c. per lb., the inside figure obtaining for round-lots in bags.

White Lead—The decline in pig lead caused much comment in trade circles and led many to look for a lower trading basis in the lead pigments. But, up to the close, corroders announced no changes. The metal closed the week at 7¼c., New York, which compares with 7¾c. a week ago. The decline was attributed to the developments in the European situation. Standard dry white lead (basic carbonate) held at 9¾c. per lb., carload lots, in casks.

Imports at the Port of New York

May 4 to May 10

ACIDS — 82 dr. cresylic, Rotterdam, Lunham & Moore; 147 demijohns formic, Hamburg, Innis, Speiden & Co.; 74 dr. formic, Hamburg, Order; 300 bl. stearic, Rotterdam, Strohmeyer & Arpe Co.; 40 cs. stearic, Rotterdam, Parsons & Plymouth Organic Lab.; 13 dr. cresylic, Liverpool, W. E. Jordan & Bros.; 65 dr. cresylic, Liverpool, Order; 134 keg solid carbolic, Liverpool, Order; 139 carboys formic, Rotterdam, R. W. Greef & Co.; 76 dr. cresylic, Glasgow, Order; 500 csk. citric, Palermo, Order; 33 bbl. citric, Palerma, F. Vitrano; 44 bbl. tartaric, Palerm., F. Vitrano.

AMMONIUM—200 dr., Hamburg, Hans Hinrichs Chem. Corp.; 45 csk. sulphate, Hamburg, Harriman Nat'l Bank; 20 csk. carbonate, Liverpool, Brown Bros. & Co.; 20 cs. chloride, Liverpool, Wing & Evans.

AMYL ALCOHOL—7 cs., Hamburg, Hensel, Bruckmann & Lorbacher.

ARSENIC—83 csk., Rotterdam, Lunham & Moore; 8 keg, London, Order; 51 csk., Hamburg, Roessler & Hasslacher Chem. Co.; 100 csk., Hamburg, J. Marcus, Inc.; 52 csk. and 50 cs., Rotterdam, Order; 300 cs., Kobe, G. F. Taylor & Co.; 250 cs., Kobe, H. Sundheimer, Inc.; 100 cs., Kobe, S. L. Jones & Co.; 59 cs., Kobe, J. D. Lewis; 75 cs., Kobe, China-Am. Tobacco & Trading Co.; 288 cs., Kobe, S. W. Bridges & Co.; 712 cs., Kobe, Order; 800 cs., Yokohama, Chapman Chem. Eng. Co.; 229 bbl., Antwerp, Order.

BARIUM CHLORIDE—51 csk., Hamburg, A. Klipstein & Co.

BARIUM NITRATE—27 csk., Hamburg, A. Klipstein & Co.

BARIUM PEROXIDE — 49 csk., Hamburg, W. A. Brown & Co.

BRONZE POWDER—12 cs., Bremen, B. F. Drakenfeld & Co.

CALCIUM CHLORIDE—859 bbl, Hamburg, Irving Bank-Col. Trust Co.; 336 dr., Hamburg, Pfaltz & Bauer; 96 bbl., Hamburg, Order.

CAMPHOR—200 cs., Hong Kong, Suzuki & Co.; 100 cs., Kobe, Nat'l Park Bank.

CASEIN—400 bg., London, Brit. Bank of South America; 400 bg., Hamburg, Order; 200 bg. Rotterdam, N. Y. Trust Co.; 350 bg., Auckland, Asia Banking Corp.; 350 sk., Wellington, Equitable Trust Co.; 223 bg., Hamburg, Bank of Manhattan Co.

CHALK—500 bg., Antwerp, American Express Co.; 1,500 bg., Antwerp, Irving Bank-Col. Trust Co.; 400 bg., Antwerp, Reichard-Coulston, Inc.; 300 bg., Antwerp, C. B. Crystal & Co.

CHLOROFORM—3 cs., Hamburg, Morgenstern & Co.

CHEMICALS — 254 bbl., Antwerp, Roessler & Hasslacher Chem. Co.; 63 csk., Bremen, Hummel & Robinson; 102 csk., Bremen, Am. Exchange Nat'l Bank; 61 cs., Hamburg, Eimer & Amend; 10 cs., Hamburg, Merck & Co.

CHINA CLAY — 2,766 tons, Fowey, Moore & Munger; 1,938 tons, Fowey, Eng. China Clay Sales Co.; 500 tons, Fowey, Hammill & Gillespie.

COPPER SULPHATE — 201 csk., Antwerp, Order.

COLORS — 3 cs. aniline, Southampton, Irving Bank-Col. Trust Co.; 10 csk. dry, Southampton, Order; 2 csk. dry, Bremen, M. G. Lange & Co.; 30 pkg., Rotterdam, H. A. Metz & Co.; 6 bbl., Rotterdam, Wetterwald & Pfister; 11 csk. aniline, Rotterdam, B. Bernard; 7 csk. do., Rotterdam, F. Donders; 3 csk. do., Rotterdam, Order; 4 csk., Hamburg, Kutroff, Pickhardt & Co.; 15 pkg. aniline, Hamburg, Franklin Imp. & Export Co.; 26 csk. aniline, Genoa, Am. Exchange Natl Bank; 33 csk. do., Genoa, Irving Bank; 12 bbl., Havre, Carbic Color & Chem. Co.; 35 csk., Havre, Glegy Co.

DEXTRINE—100 bg., Rotterdam, Spier, Simmons Co.; 50 bg., Rotterdam, Order.

DEGRAS—90 bbl., Antwerp, Lunham & Moore; 29 csk., Bremen, C. H. Hilbert; 150 bbl., Bremen, Pfaltz & Bauer.

DYES — 78 pkg., Antwerp, Am. Exchange Nat'l Bank; 3 csk., Southampton, Am. Exchange Nat'l Bank.

FERTILIZER — 1,270 bg. nitrogenious, Hamburg, Hollingshurst & Co.; 336 bg., London, Carter's Tested Seeds, Inc.

FERROCHROME — 500 cs., Hamburg, Hardy & Ruperti.

FERRIC CHLORIDE—38 bbl., Hamburg, Mallinckrodt Chem. Works.

FUSEL OIL—22 dr., Rotterdam, Caldwell & Co.; 16 dr., Rotterdam, Order; 31 dr., Hamburg, Maas & Waldstein; 18 csk., Hamburg, Guaranty Trust Co.; 117 dr., Hamburg, Order.

GAMBIER—521 cs., Singapore, Order.

GLAUBERS SALT—200 bbl., Hamburg, Order.

GLYCERINE — 125 dr., Buenos Aires, Thornett & Fehr; 305 csk., Marseilles, Order; 28 dr., London, Marx & Rawolleo.

GUMS—1,250 bg. arabic, Sudan, Order; 150 bg. arabic, Sudan, Anglo-Egyptian Bank; 64 bg. damar, Singapore, Paterson, Boardman & Knapp; 128 bg. damar and 50 bg. copal, Singapore, L. C. Gillespie & Sons; 256 pkg. damar and 64 pkg. copal, Singapore, Order; 20 bg. copal, Manila, Order; 38 cs. tragacanth, London, Thurston & Braidich; 182 bg. copal, Singapore, Baring Bros. & Co.; 172 bg. copal, Singapore, Irving Bank-Col. Trust Co.; 500 pkg. damar, Singapore, Order; 23 bg. sandrac, London, G. H. Lincks; 259 pkg. kauri, Auckland, Brown Bros. & Co.; 119 cs. do., Auckland, Chemical Nat'l Bank; 503 cs do., Auckland, J. D. Lewis; 339 cs. do., Auckland, Irving Bank-Col. Trust Co.; 75 cs. do., Auckland, Guaranty Trust Co.; 125 cs. do., Auckland, L. C. Gillespie & Sons; 637 sks. do., Auckland, Am. Foreign Banking Corp.; 657 pkg. do., Auckland, Order. 300 bg. yacca, Adelaide, W. Schall & Co.; 100 cs. damar, Batavia, Bank of America; 1,000 cs. damar, Batavia, Nat'l City Bank; 200 cs. damar, Batavia, Central Union Trust Co.; 210 bg. damar, Singapore, Baring Bros. & Co.; 385 bg. damar, Singapore, Kidder, Peabody & Co.; 70 bg. do., Singapore, L. C. Gillespie & Son; 50 bg. copal, Singapore, Order; 462 bg copal, Singapore, Baring Bros. & Co.; 288 bg. copal, Singapore, France, Campbell & Darling; 243 bg. copal, Singapore, Order.

HYDROGEN PEROXIDE—64 cs., Antwerp, Order.

IODINE—138 bbl., Iquique, Nash, Watjen & Bangs.

IRON OXIDE — 77 csk., Liverpool, Reichard-Coulston, Inc.; 10 csk., Liverpool, J. H. Rhodes & Co.; 72 csk., Liverpool, E. M. & F. Waldo.

IRON SULPHATE—100 bbl., Antwerp, Order.

IRON SULPHIDE — 44 bbl., Antwerp, Truempy, Faesy & Besthoff.

LEAD ARSENATE—454 csk., Hamburg, Order.

LITHOPONE—1,500 csk., Antwerp, B. Moore & Co.; 80 csk., Antwerp, E. M. & F. Waldo.

MAGNESITE—8,400 bg., Madras, Order; 83 csk. calcined, Rotterdam, Order; 105 csk., Rotterdam, Speiden, Whitfield Co.; 1,085 pkg., Rotterdam, Innis, Speiden & Co.; 1,250 bg. and 152 bbl. calcined, Rotterdam, Innis, Speiden & Co.

MAGNESIUM—72 bbl. chloride, Hamburg, Speiden, Whitfield & Co.

MANGROVE BARK—4,000 pkg., Singapore, Order.

MENTHOL—75 cs., Kobe, S. W. Bridges & Co.; 35 cs., Kobe, F. A. Cundill & Co.; 25 cs., Kobe, Stanley, Jordan & Co.

NAPHTHALENE—285 pkg., Rotterdam, Lunham & Moore; 250 bg., Hamburg, White Tar Co.; 616 bg., Hamburg, R. W. Greef & Co.; 441 bg., Hamburg, Calco Chem. Co.; 300 bg., Rotterdam, W. C. Jordan & Bros.; 3,443 bg., Rotterdam, Order.

NUX VOMICA—341 bg., Cocanada, Order.

OCHER — 125 csk., Marseilles, J. L. Smith & Co.; 90 csk., Marseilles, F. B. Vandegrift & Co.; 290 csk., Marseilles, Am. Exchange Nat'l Bank; 24 bbl., Marseilles, Osborn & Co.

OILS—**Cod**—300 csk., St. Johns, National Oil Products Co.; 330 csk., St. Johns, R. Badcock & Co.; 260 csk., St. Johns, Bowring & Co.; 200 csk., Bergen, Fidelity Union Trust Co. **Castor**—140 bbl., Antwerp, Order. **China Wood**—59 csk., Rotterdam, Order; 25 dr., London, A. A. Stilwell & Co.; 760 tons (bulk), Hankow, Balfour, Williamson & Co.; 1,557,366 lb. in bulk, Hong Kong, Mitsui & Co. **Coconut**—107 pipes, Cochin, Order; 875 tons (bulk) Manila, Spencer Kellogg & Sons. **Linseed**—100 bbl., London, Order; 581 bbl., Rotterdam, Nat'l Lead Co.; 286 bbl., Rotterdam, Smith, Weihmann Oil Co.; 145 bbl., Rotterdam, Lockwood Co.; 574 bbl., Rotterdam, W. Benkert Co.; 143 bbl., Rotterdam, Meteor Products Co.; 171 bbl., Rotterdam, Order; 598 bbl., London, W. R. Grace & Co.; 599 bbl., London, Balfour, Williamson & Co. **Olive Oil Foots** — 100 bbl., Seville, Nat'l City Bank; 145 csk., Leghorn, Am. Co. for Int'l Comm.; 100 bbl., Naples, F. Boehm, Ltd.; 400 bbl., Naples, Order. **Palm**—201 csk., Rotterdam, African & Eastern Trading Co.; 100 csk., Liverpool, Fourth St., Nat'l Bank; 306 csk., Liverpool, D. Bacon; 294 csk., Liverpool, Niger Co.; 110 csk., Liverpool, Order; 128 csk., Hamburg, African & Eastern Trading Corp.; 258 csk., Hamburg, Order; 79 bbl., Belawan Deli, Nat'l City Bank. **Palm Kernel**—59 csk., Liverpool, Niger Co. **Perilla**—400 bbl., Darien, Balfour, Williamson & Co.; 100 bbl., Kobe, Mitsui & Co.; 150 bbl., Kobe, Bank of N. Y. **Sesame**—291 bbl., Rotterdam, Nat'l City Bank.

OIL SEEDS—**Castor**—42,973 bg., Cocanada, Order; 2,296 bg., Para, Central Union Trust Co.; 1,782 bg., Santos, Bank of N. Y. & Trust Co. **Linseed**—69,018 bg., Buenos Aires, Order; 8,700 bg., Rosario, Order; 26,764 bg., Rosario, L. Dreyfus & Co.; 16,609 bg., Buenos Aires, Order; 124,944 bg., Buenos Aires, Order; 8,111 tons, Buenos Aires; L. Dreyfus & Co.; 17,451 bg., Rosario, Order; 6,127 tons, Rosario, Spencer Kellogg & Sons.

PITCH—12 bbl., Liverpool, Order.

PYRIDINE—10 dr., Rotterdam, P. E. Falkingham; 5 dr. do., Rotterdam, Meteor Products Co.; 24 dr., Rotterdam, Lunham & Moore.

POTASSIUM SALTS—100 dr. permanganate, Rotterdam, J. D. Lewis; 2,000 bg. muriate and 50 bbl. sulphate, Bremen, A. Vogel; 88 csk. nitrate, E. Suter & Co.; 10 dr. permanganate, Hamburg, Equitable Trust Co.; 648 dr. caustic, Hamburg, A. Klipstein & Co.; 29 csk. salts, Hamburg, A. Klipstein & Co.; 93 dr. caustic, Hamburg, Order; 43 csk. carbonate, Hamburg, Order; 1,025 pkg. cholrate, Marseilles, Asia Banking Corp.; 250 bbl. chlorate, Marseilles, Order; 100 dr. perchlorate, Marseilles, Order; 49 csk. prussiate, Liverpool, Order; 100 dr. permanganate, Hamburg, Order; 4,500 bbl. chlorate, Hamburg, Order; 30 csk. metabisulphite, Hamburg, Order; 3,000 bg. muriate and 3,000 bg. sulphate, Hamburg, Order; 2,250 bg. muriate, Antwerp, Soc. Comm. des Potasses de'Alsace; 1,250 csk. chlorate, Antwerp, Order; 225 csk. do., Marseilles, Order.

QUICKSILVER — 60 fl., Vera Cruz, Poillon & Poirier; 1,000 fl., Alicante, Haas Bros.; 50 fl., Genoa, Order.

QUEBRACHO—25,053 bg., Buenos Aires, Tannin Corp.

SHELLAC — 590 cs., Hangkok, Order; 300 bg., London, Order; 29 cs., Hamburg, A. Murphy & Co.; 25 bg., Hamburg, Irving Bank-Col. Trust Co.

SODIUM SALTS — 7,503 bg. nitrate, Iquique, Wessel, Duval & Co.; 10,355 bg., Iquique, E. I. du Pont de Nemours & Co.; 93 bbl., phosphate, Antwerp, A. Klipstein & Co.; 62 dr., sulphite, Hamburg, Order; 150 cs., chlorate, Genoa, C. W. Campbell; 12 csk., prussiate, Liverpool, Order; 200 csk. hyposulphite, Hamburg, Order; 160 bg. silicate, Hamburg, Order; 216 csk. nitrite, Brevik, Order; 4,105 bg. synthetic nitrate, Brevik, Order; 7,815 bg. nitrate, Antofagasta, W. R. Grace & Co.; 9,851 bg. nitrate, Iquique, W. R. Grace & Co.

SULPHUR—15 csk. refined, Liverpool, McKesson & Robbins; 6 csk. do., Liverpool, Mallinckrodt Chem. Works; 40 cs. refined, Hamburg, Order.

SUMAC—1,050 bg., Palermo, Nat'l City Bank; 910 bg., Palermo, Order.

TALLOW—147 csk., Buenos Aires, Bank of the Manhattan Co.; 273 tc., Montevideo, Battery Park Nat'l Bank; 161 csk., Buenos Aires, Swift & Co.; 152 pkg., Montevideo, Swift & Co.

TARTAR—276 bg., Seville, Order; 220 bg., Marseilles, C. Pfizer & Co.; 427 bg., Marseilles, Tartar Chem. Co.; 306 bg., Alicante, Tarter Chem. Co.

THORIUM NITRATE—50 cs, Hamburg, American, Kruger & Toll Corp.

TUMERIC—507 bg, Cochin, Order: 29 bg, Aleppey, Darragh, Small & Co.

VEGETABLE TALLOW—500 pkg., Hankow, Am. Linseed Co.

WAXES—87 bg bees, Antwerp, Elbert & Co.; 222 pkg. carnauba, Ceara, Lazard Freres; 222 pkg do. Ceara, Nat'l Park Bank; 800 bg paraffine, London. Asiatic Petroleum Co.; 283 bg. carnauba, Para, Int'l Acceptance Bank; 177 bg. do, Para, Lazard Freres; 967 bg. do, Para, Nat'l City Bank; 167 bg. do, Para, Strohmeyer & Arpe; 910 bg do, Para, Order.

WHITING—2,000 bg, Antwerp, Brooklyn Trust Co.

ZINC CHORIDE—138 csk, Hamburg, Order 17 bbl. Hamburg, Order.

ZINC OXIDE—100 csk, Rotterdam, E. M. & F. Waldo.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

General Chemicals

Acetic anhydride, 85%, drums	lb.	$0.38 –	....
Acetone, drums	lb.	.25 –	.25½
Acid, acetic, 28%, bbl.	100 lb.	3.38 –	3.50
Acetic, 56%, bbl.	100 lb.	6.75 –	7.00
Glacial, 99½%, bbl.	100 lb.	12.00 –	12.50
Boric, bbl.	lb.	.10½–	....
Citric, kegs	lb.	.49 –	.52
Formic, 85%	lb.	.14 –	.16
Gallic, tech.	lb.	.45 –	.50
Hydrofluoric, 52%, carboys	lb.	.12 –	.12½
Lactic, 44%, tech., light, bbl.	lb.	.11½–	.12
22% tech., light, bbl.	lb.	.05½–	.06
Muriatic, 18° tanks	100 lb.	.90 –	1.00
Muriatic, 20°, tanks,	100 lb.	1.00 –	1.10
Nitric, 36°, carboys	lb.	.04½–	.05
Nitric, 42°, carboys	lb.	.06 –	.06½
Oleum, 20%, tanks	ton	18.50 –	19.00
Oxalic, crystals, bbl.	lb.	.13½–	.13¾
Phosphoric, 50% carboys	lb.	.07½–	.08½
Pyrogallic, resublimed	lb.	1.50 –	1.60
Sulphuric, 60°, tanks	ton	9.50 –	11.00
Sulphuric, 60°, drums	ton	13.00 –	14.00
Sulphuric, 66°, tanks	ton	16.00 –	16.50
Sulphuric, 66° drums	ton	20.00 –	21.00
Tannic, U.S.P., bbl.	lb.	.65 –	.70
Tannic, tech., bbl.	lb.	.45 –	.50
Tartaric, imp. crys., bbl.	lb.	.37 –	....
Tartaric, imp., powd., bbl.	lb.	.37 –	....
Tartaric, domestic, bbl.	lb.	.37½–	....
Tungstic, per lb.	lb.	1.10 –	1.20
Alcohol, butyl, drums, f.o.b. works	lb.	.26 –	.28
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.75 –	4.95
Ethyl, 190 p'f. U.S.P., bbl.	gal.	4.70 –	....
Alcohol, methyl (see Methanol)			
Alcohol, denatured, 190 proof No. 1, special bbl.	gal.	.39 –	.41
No. 1, special, dr.	gal.	.33 –	.35
No. 1, 188 proof, bbl	gal.	.40 –	.42
No. 1, 188 proof, dr.	gal.	.34 –	.36
No. 5, 188 proof, bbl.	gal.	.38 –	.40
No. 5, 188 proof, dr.	gal.	.32 –	.34
Alum, ammonia, lump, bbl.	lb.	.03½–	.03¾
Potash, lump, bbl.	lb.	.02¾–	.03¼
Chrome, lump, potash, bbl.	lb.	.05¼–	.05½
Aluminum sulphate, com., bags	100 lb.	1.50 –	1.65
Iron free bags	lb.	.02½–	.02¾
Aqua ammonia, 26°, drums	lb.	.06¾–	.07¼
Ammonia, anhydrous, cyl.	lb.	.30 –	.30½
Ammonium carbonate, powd. casks, imported	lb.	.09½–	.10
Ammonium carbonate, powd. domestic, bbl.	lb.	.13 –	.14
Ammonium nitrate, tech., casks	lb.	.10 –	.11
Amyl acetate tech., drums	gal.	3.50 –	3.75
Arsenic, white, powd., bbl.	lb.	.14¾–	.15
Arsenic, red, powd., kegs	lb.	.14¼–	.14½
Barium carbonate, bbl.	ton	78.00 –	80.00
Barium chloride, bbl.	ton	90.00 –	95.00
Barium dioxide, drums	lb.	18 –	.18½
Barium nitrate, casks	....	.08 –	.08½
Barium sulphate, bbl.	lb.	.04 –	.04½
Blanc fixe, dry, bbl.	lb.	.04 –	.04½
Bleaching powder, f.o.b. wks., drums	100 lb.	1.90 –	....
Spot N. Y. drums	100 lb.	2.40 –	....
Borax, bbl.	lb.	.05¼–	.05½
Bromine, cases	lb	.28 –	.30
Calcium acetate, bags	100 lb.	4.00 –	4.05
Calcium arsenate, dr.	lb.	.17 —	.18
Calcium carbide, drums	lb.	.05¼–	.05½
Calcium chloride, fused, drums	ton	22.00 –	23.00
Gran. drums	ton	28.00 –	30.00
Calcium phosphate, mono, bbl.	lb.	.06½–	.07
Camphor, cases	lb.	.86 –	.88
Carbon bisulphide, drums	lb.	.07 –	.07½
Carbon tetrachloride, drums.	lb.	.09½–	.10
Chalk, precip.—domestic, light, bbl.	lb.	.04½–	.04¾
Domestic, heavy, bbl.	lb.	.03½–	.03¾
Imported, light, bbl.	lb.	.04½–	.05
Chlorine, liquid, cylinders	lb.	.06 –	.06½
Chloroform, tech., drums	lb.	.35 –	.38
Cobalt oxide, bbl.	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks.	ton	19.00 –	20.00
Copper carbonate, bbl.	lb.	.19 –	.20
Copper cyanide, drums	lb.	.47 –	.50
Copper sulphate, crys., bbl.,	100 lb.	6.00 –	6.25
Cream of tartar, bbl.	lb.	.25½–	.26½
Epsom salt, dom., tech., bbl.	100 lb.	1.90 –	2.15
Epsom salt, imp., tech., bags	100 lb.	1.00 –	1.15
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.50 –	2.60
Ether, U.S.P., drums	lb.	.13 –	.15
Ethyl acetate, com., 85%, drums	gal.	.80 –	.85
Ethyl acetate, pure (acetic ether, 98% to 100%)	gal.	.95 –	1.00

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

Formaldehyde, 40%, bbl.	lb.	$0.14½–	$0.15½
Fullers earth—imp., powd., net	ton	30.00 –	32.00
Fusel oil, ref., drums	gal.	3.55 –	4.05
Fusel oil, crude, drums	gal.	2.50 –	2.60
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40
Glaubers salt, imp., bags	100 lb.	.85 –	.95
Glycerine, c.p., drums extra	lb.	.17½–	....
Glycerine, dynamite, drums	lb.	.16¼–	.16½
Glycerine, crude 80%, loose	lb	.11 –	.11½
Iodine, resublimed	lb.	4.55 –	4.65
Iron oxide, red, casks	lb.	.12 –	.18
Lead:			
White, basic carbonate, dry, casks	lb.	.09¾–	.10
White, basic sulphate, casks	lb.	.09¼–	....
White, in oil, kegs	lb.	.12¼–	.14
Red, dry, casks	lb.	.11¾–	.12
Red, in oil, kegs	lb.	.13¼–	.15
Lead acetate, white crys., bbl.	lb.	.13½–	.14
Brown, broken, casks	lb.	.12½–	....
Lead arsenate, powd., bbl.	lb.	.23 –	.24
Lime-Hydrated, bbl.	per ton	16.80 –	17.00
Lime, Lump, bbl.	280 lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.10¾–	.11
Lithophone, bags	lb.	.07 –	.07½
in bbl.	lb.	.07 –	.07¾
Magnesium carb., tech., bags	lb.	.08 –	.08½
Methanol, 95%, bbl.	gal.	1.18 –	1.20
Methanol, 97%, bbl.	gal.	1.20 –	1.22
Nickel salt, double, bbl.	lb.	.10½–	....
Nickel salts, single, bbl.	lb.	.11½–	....
Phosgene	....	.60 –	.75
Phosphorus, red, cases	lb.	.35 –	.40
Phosphorus, yellow, cases	lb.	.30 –	.35
Potassium bichromate, casks	lb.	.11½–	.11¾
Potassium bromide, gran., bbl.	lb.	.19 –	.20
Potassium carbonate, 80-85%, calcined, casks	lb.	.06¾–	.07½
Potassium chlorate, powd.	lb.	.07½–	.08
Potassium cyanide, drums	lb.	.45 –	.50
Potassium, first sorts, cask	lb.	.09	.09½
Potassium hydroxide (caustic potash) drums	lb.	.08½–	.09
Potassium iodide, cases	lb.	3.65 –	3.75
Potassium nitrate, bbl.	lb.	.06½–	.07½
Potassium permanganate, drums	lb.	.20 –	.21
Potassium prussiate, red, casks	lb.	.70 –	.72
Potassium prussiate, yellow, casks	lb.	.36½–	.37
Salammoniac, white, gran., casks, imported	lb.	.07 –	.07½
Salammoniac, white, gran., bbl., domestic	lb.	.07½–	.08
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl.	100 lb.	1.20	1.40
Salt cake (bulk)	ton	26.00 –	28.00
Soda ash, light, 58% flat, bags, contract	100 lb.	1.60 –	1.67
Soda ash, light, basis, 48%, bags, contract, f.o.b. wks.	100 lb.	1.20 –	1.30
Soda ash, light, 58%, flat, bags, resale	100 lb.	1.75 –	1.80
Soda ash, dense, bags, contract, basis 48%	100 lb.	1.17½–	1.20
Soda ash, dense, in bags, resale	100 lb.	1.85 –	1.90
Soda, caustic, 76%, solid, drums, f.a.s.	100 lb.	3.30 –	3.40
Soda, caustic, basis 60%, wks., contract	100 lb.	2.50 –	2.60
Soda, caustic, ground and flake, contracts	100 lb.	3.80 –	3.90
Soda, caustic, ground and flake, resale	100 lb.	3.72½–	....
Sodium acetate, works, bags	lb.	.05½–	.06½
Sodium bicarbonate, bbl.	100 lb.	2.00 –	2.50
Sodium bichromate, casks	lb.	.08½–	.08¾
Sodium bisulphate (niter cake)	ton	6.00 –	7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb.	.04½–	.04¾
Sodium chlorate, kegs	lb.	.06½–	.07
Sodium chloride	long ton	12.00 –	13.00
Sodium cyanide, cases	lb.	.20 –	.23
Sodium fluoride, bbl.	lb.	$0.09½–	$0.10
Sodium hyposulphite, bbl.	lb.	.02½–	.03
Sodium nitrite, casks	lb.	.08 –	.08½
Sodium peroxide, powd., cases	lb.	.28 –	.30
Sodium phosphate, dibasic, bbl.	lb.	.03½–	.04
Sodium prussiate, yel. drums	lb.	.17¼–	.17½
Sodium silicate (40°, drums)	100 lb.	.80 –	1.25
Sodium silicate (60°, drums)	100 lb.	2.00 –	2.25
Sodium sulphide, fused, 60-62% drums	lb.	.04½–	.04¾
Sodium sulphite, crys., bbl.	lb.	.03½–	.03¾
Strontium nitrate, powd., bbl.	lb.	.12½–	.13
Sulphur chloride, yel drums.	lb.	.04½–	.05
Sulphur, crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Sulphur, flour, bag	100 lb.	2.25 –	2.35
Sulphur, roll, bag	100 lb.	2.00 –	2.10
Sulphur dioxide, liquid, cyl.	lb.	.08 –	.08½
Talc—imported, bags	ton	30.00 –	40.00
Talc—domestic powd., bags.	ton	18.00 –	25.00
Tin bichloride, bbl.	lb.	.12½–	.13¾
Tin oxide, bbl.	lb.	.50 –	....
Tin crystals, bbl.	lb.	.35½–	.36
Zinc carbonate, bags	lb.	.14 –	.14½
Zinc chloride, gran, bbl.	lb.	.06 –	.07
Zinc cyanide, drums	lb.	.37 –	.38
Zinc oxide, , lead free, bbl.	lb.	.08 –	.08½
5% lead sulphate, bags	lb.	.07½–	......
10 to 35 % lead sulphate, bags	lb.	.07 –	......
French, red seal, bags	lb.	.09¾–	......
French, green seal, bags	lb.	.10¾–	......
French, white seal, bbl	lb.	.12 –	......
Zinc sulphate, bbl.	100 lb.	2.50 –	3.00

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.65 –	$0.80
Alpha-naphthol, ref., bbl.	lb.	.75 –	.90
Alpha-naphthylamine, bbl.	lb.	.35 –	.37
Aniline oil, drums	lb.	.16 –	.16½
Aniline salts, bbl.	lb.	.24 –	.25
Anthracene, 80%, drums	lb.	.75 –	1.00
Anthracene, 80%, imp., drums, duty paid	lb.	.70 –	.75
Anthraquinone, 25%, paste, drums	lb.	.70 –	.75
Benzaldehyde U.S.P., carboys	lb.	1.40 –	1.45
tech, drums	lb	75	80
Benzene, pure, water-white, tanks and drums	gal.	.30 –	.32
Benzene, 90%, tanks & drums	gal.	.27 –	.30
Benzene, 90%, drums, resale	gal.	.30 –	.33
Benzidine base, bbl.	lb.	.85 –	.90
Benzidine sulphate, bbl.	lb.	.70 –	.75
Benzoic acid, U.S.P., kegs	lb.	.72 –	75
Benzoate of soda, U.S.P., bbl.	lb.	.57 –	.65
Benzyl chloride, 95-97%, ref., drums	lb.	.45 –	..
Benzyl chloride, tech., drums	lb.	.30 –	.35
Beta-naphthol, subl., bbl.	lb.	.55 –	.60
Beta-naphthol, tech., bbl.	lb.	.22½–	.23
Beta-naphthylamine, tech.	lb.	.80 –	.90
Carbazol, bbl.	lb.	.75 –	.90
Cresol, U.S.P., drums	lb.	.25 –	.29
Ortho-cresol, drums	lb.	.28 –	.30
Cresylic acid, 97%, resale, drums	gal.	1.30 –	..
95-97%, drums, resale	gal.	1.20 –	1.25
Dichlorbenzene, drums	lb.	.07 –	.09
Diethylaniline, drums	lb.	.50 –	.60
Dimethylaniline, drums	lb.	.42 –	.43
Dinitrobenzene, bbl.	lb.	.19 –	.20
Dinitroclorbenzene, bbl.	lb.	.22 –	.23
Dinitronaphthalene, bbl.	lb.	.30 –	.32
Dinitrophenol, bbl	lb.	.35 –	.40
Dinitrotoluene, bbl	lb.	.20 –	.22
Dip oil, 25%, drums	gal.	.25 –	.30
Diphenylamine, bbl.	lb.	.50 –	.52
H-acid, bbl.	lb.	.82 –	.90
Meta-phenylenediamine, bbl.	lb.	1.00 –	1.05
Michlers ketone, bbl.	lb.	3.00 –	3.50
Monochlorbenzene, drums	lb.	.08 –	.10
Monoethylaniline, drums	lb.	.95 –	1.10
Naphthalene, flake, bbl.	lb.	.09 –	.09½
Naphthalene, balls, bbl.	lb.	.09½–	.10½
Naphthionate of soda, bbl.	lb.	.58 –	.65
Naphthionic acid, crude, bbl.	lb.	.55 –	.60
Nitrobenzene, drums	lb.	.10 –	.12
Nitro-naphthalene, bbl.	lb.	.30 –	.35
Nitro-toluene, drums	lb.	.15 –	.17
N-W acid, bbl.	lb.	1.25 –	1.30
Ortho-amidophenol, kegs	lb.	2.30 –	2.35
Ortho-dichlorbenzene, drums	lb.	.17 –	.20
Ortho-nitrophenol, bbl.	lb.	.90 –	.92
Ortho-nitrotoluene, drums	lb.	.10 –	.12
Ortho-toluidine, bbl.	lb.	.14 –	.15
Para-amidophenol, base, kegs	lb.	1.20 –	1.30
Para-amidophenol, HCl, kegs	lb.	1.25 –	1.35
Para-dichlorbenzene, bbl.	lb.	.17 –	.20
Paranitraniline, bbl.	lb.	.74 –	.75
Para-nitrotoluene, bbl.	lb.	.60 –	.65
Para-phenylenediamine, bbl.	lb.	1.45 –	1.50
Para-toluidine, bbl	lb.	.95 –	.98
Phthalic anhydride, bbl.	lb.	.35 –	.38
Phenol, U.S.P., drums	lb.	.55 –	.57
Picric acid, bbl.	lb.	.20 –	.22
Pyridine, dom., drums	gal.	nominal	

Pyridine, imp., drums	gal.	$2.50 –	$2.75
Resorcinol, tech., kegs	lb.	1.40 –	1.50
Resorcinol, pure, kegs	lb.	2.00 –	2.25
R-salt, bbl	lb.	.55 –	.60
Salicylic acid, tech., bbl	lb.	.47 –	.48
Salicylic acid, U.S.P., bbl	lb.	.50 –	.52
Solvent naphtha, water-white, drums	gal.	.37 –	.40
Crude, drums	gal.	.24 –	....
Sulphanilic acid, crude, bbl	lb.	.18 –	.20
Thiocarbanilide, kegs	lb.	.35 –	.38
Toluidine, kegs	lb.	1.20 –	1.30
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars	gal.	.30 –	.35
Toluene, drums	gal.	.35 –	.40
Xylidines, drums	lb.	.45 –	.47
Xylene, pure, drums	gal.	.75 –	1.00
Xylene, com., drums	gal.	.37 –	......
Xylene, com., tanks	gal.	.32 –	......

Naval Stores

Rosin B-D, bbl	280 lb.	$6.10 –	....
Rosin E-I, bbl	280 lb.	6.15 –	....
Rosin K-N, bbl	280 lb.	6.20 –	....
Rosin W.G.-W.W., bbl	280 lb.	6.50 –	7.50
Wood rosin, bbl	280 lb.	6.00 –	6.10
Turpentine, spirits of, bbl	gal.	1.08 –	....
Wood, steam dist., bbl	gal.	1.04 –	....
Wood, dest. dist., bbl	gal.	.90 –	....
Pine tar pitch, bbl	200 lb.	.... –	6.00
Tar, kiln burned, bbl	500 lb.	.... –	13.00
Retort tar, bbl	500 lb.	.... –	12.00
Rosin oil, first run, bbl	gal.	.45 –	......
Rosin oil, second run, bbl	gal.	.48 –	......
Rosin oil, third run, bbl	gal.	.52 –	......
Pine oil, steam dist.	gal.	.80 –	......
Pine oil, pure, dest. dist.	gal.	.75 –	......
Pine tar oil, ref.	gal.	.48 –	......
Pine tar oil, crude, tanks f.o.b. Jacksonville, Fla.	gal.	.32 –	.32½
Pine tar oil, double ref., bbl	gal.	.... –	.75
Pine tar, ref., thin, bbl	gal.	.... –	.25
Pinewood creosote, ref., bbl.	gal.	.... –	.52

Animal Oils and Fats

Degras, bbl	lb.	$0.03¾ –	$0.04¼
Grease, yellow, bbl	lb.	.07½ –	.07¾
Lard oil, Extra No. 1, bbl	gal.	.90 –	.92
Neatsfoot oil, 20 deg. bbl	gal.	1.30 –	....
No. 1, bbl	gal.	.92 –	.94
Oleo Stearine		.10½ –	......
Red oil, distilled, d.p. bbl	lb.	.11 –	.11½
Saponified, bbl	lb.	.11 –	.11½
Tallow, extra, loose	lb.	.08 –	......
Tallow oil, acidless, bbl	gal.	.94 –	.96

Vegetable Oils

Castor oil, No. 3, bbl	lb.	$0.14 –	......
Castor oil, No. 1, bbl	lb.	.14½ –	......
Chinawood oil, bbl	lb.	.34 –	.35
Coconut oil, Ceylon, bbl	lb.	.10 –	.10½
Ceylon, tanks, N.Y.	lb.	.08½ –	.09
Coconut oil, Cochin, bbl	lb.	.10½ –	.10¾
Corn oil, crude, bbl	lb.	.12½ –	......
Crude, tanks, (f.o.b. mill)	lb.	.10 –	......
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.09½ –	......
Summer yellow, bbl	lb.	.12 –	......
Winter yellow, bbl	lb.	.13½ –	.13¾
Linseed oil, raw, car lots, bbl.	gal.	1.14 –	......
Raw, tank cars (dom.)	gal.	1.09 –	......
Boiled, cars, bbl. (dom.)	gal.	1.16 –	......
Olive oil, denatured, bbl	gal.	1.10 –	......
Sulphur, (foots) bbl	lb.	.09½ –	.09¾
Palm, Lagos, casks	lb.	.07½ –	.08
Niger, casks	lb.	.07 –	.07½
Palm kernel, bbl	lb.	.09½ –	......
Peanut oil, crude, tanks (mill)	lb.	.13½ –	......
Peanut oil, refined, bbl	lb.	.17 –	......
Perilla, bbl	lb.	.16½ –	.16¾
Rapeseed oil, refined, bbl	gal.	.84 –	.85
Rapeseed oil, blown, bbl	gal.	.90 –	.91
Sesame, bbl	lb.	.11½ –	.12½
Soya bean (Manchurian), bbl.	lb.	.13 –	......
Tank, f.o.b. Pacific coast	lb.	.10½ –	.10¾
Tank, (f.o.b. N.Y.)	lb.	.10½ –	.10¾

Fish Oils

Cod, Newfoundland, bbl	gal.	$0.70 –	$0.72
Menhaden, light pressed, bbl.	gal.	.76 –	......
White bleached, bbl	gal.	.78 –	......
Blown, bbl	gal.	.82 –	......
Crude, tanks (f.o.b. factory)	gal.	.50 –	......
Whale No. 1 crude, tanks, coast	lb.	.07½ –	.08
Winter, natural, bbl	gal.	.76 –	.78
Winter, bleached, bbl	gal.	.79 –	.80

Oil Cake and Meal

Coconut cake, bags	ton	$32.00 –	.....
Copra, sun dried, bags, (c.i.f.)	lb.	.05½ –	.....
Sun dried Pacific coast	lb.	.05½ –	.....
Cottonseed meal, f.o.b. mills	ton	38.00 –	.....
Linseed cake, bags	ton	36.00 –	.....
Linseed meal, bags	ton	38.50 –	.....

Dye & Tanning Materials

Albumen, blood, bbl	lb.	$0.45 –	$0.50
Albumen, egg, tech, kegs	lb.	.80 –	.85
Cochineal, bags	lb.	.35 –	.36
Cutch, Borneo, bales	lb.	.04½ –	.05
Cutch, Rangoon, bales	lb.	.13 –	.13½
Dextrine, corn, bags	100 lb.	3.64 –	3.69
Dextrine, gum, bags	100 lb.	3.99 –	4.09
Divi-divi, bags	ton	38.00 –	39.00
Fustic, sticks	ton	30.00 –	35.00
Fustic, chips, bags	lb.	.04 –	.05
Logwood, sticks	ton	28.00 –	30.00
Logwood, chips, bags	lb.	.02½ –	.03½
Sumac, leaves, Sicily, bags	ton	70.00 –	72.00
Sumac, ground, bags	ton	$65.00 –	$67.00
Sumac, domestic, bags	ton	40.00 –	42.00
Starch, corn, bags	100 lb.	2.97 –	3.07
Tapioca flour, bags	lb.	.05½ –	.06½

Extracts

Archil, conc., bbl	lb.	$0.17 –	$0.18
Chestnut, 25% tannin, tanks.	lb.	.02 –	.03
Divi-divi, 25% tannin, bbl	lb.	.04 –	.05
Fustic, crystals, bbl	lb.	.20 –	.22
Fustic, liquid, 42°, bbl	lb.	.08 –	.09
Gambier, liq., 25% tannin, bbl.	lb.	.08 –	.09
Hematine crys., bbl	lb.	.14 –	.18
Hemlock, 25% tannin, bbl	lb.	.04 –	.05
Hypernic, solid, drums	lb.	.24 –	.26
Hypernic, liquid, 51°, bbl	lb.	.14 –	.17
Logwood, crys., bbl	lb.	.19 –	.20
Logwood, liq., 51°, bbl	lb.	.09 –	.10
Quebracho, solid, 65% tannin, bbl	lb.	.04½ –	.05
Sumac, dom., 51°, bbl	lb.	.06½ –	.07

Dry Colors

Blacks–Carbongas, bags, f.o.b. works	lb.	$0.16 –	$0.18
Lampblack, bbl	lb.	.12 –	.40
Mineral, bulk	ton	35.00 –	45.00
Blues–Bronze, bbl	lb.	.55 –	.60
Prussian, bbl	lb.	.55 –	.60
Ultramarine, bbl	lb.	.08 –	.35
Browns, Sienna, Ital., bbl	lb.	.06 –	.14
Sienna, Domestic, bbl	lb.	.03½ –	.04
Umber, Turkey, bbl	lb.	.04 –	.04½
Greens–Chrome, C.P. Light, bbl	lb.	.32 –	.34
Chrome, commercial, bbl	lb.	.12 –	.12½
Paris, bulk	lb.	.30 –	.35
Reds, Carmine No. 40, tins	lb.	4.50 –	4.70
Oxide red, casks	lb.	.10 –	.14
Para toner, kegs	lb.	1.00 –	1.10
Vermilion, English, bbl	lb.	1.30 –	1.32
Yellow, Chrome, C.P. bbls	lb.	.20 –	.21
Ocher, French, casks	lb.	.02½ –	.03

Waxes

Bayberry, bbl	lb.	$0.28 –	$0.30
Beeswax, crude, bags	lb.	.19½ –	.20½
Beeswax, refined, light, bags	lb.	.32 –	.34
Beeswax, pure white, cases	lb.	.40 –	.41
Candellila, bags	lb.	.23 –	.24
Carnauba, No. 1, bags	lb.	.42 –	.43
No. 2, North Country, bags	lb.	.23 –	.23½
No. 3, North Country, bags	lb.	.19 –	.19½
Japan, cases	lb.	.14½ –	.15
Montan, crude, bags	lb.	.04½ –	.04¾
Paraffine, crude, match, 105-110 m.p.	lb.	.04½ –	.04¾
Crude, scale 124-126 m.p., bags	lb.	.03 –	.03½
Ref., 118-120 m.p., bags	lb.	.03¼ –	....
Ref., 125 m.p., bags	lb.	.03¾ –	....
Ref., 128-130 m.p., bags	lb.	.04½ –	.04¾
Ref., 133-135 m.p., bags	lb.	.05 –	....
Ref., 135-137 m.p., bags	lb.	.05½ –	.05¾
Stearic acid, sgle pressed, bags	lb.	.13¾ –	....
Double pressed, bags	lb.	.14¾ –	....
Triple pressed, bags	lb.	.15¾ –	.16

Fertilizers

Ammonium sulphate, bulk, f.o.b. works	100 lb.	$3.25 –	$3.30
F.a.s. double bags	100 lb.	3.85 –	3.90
Blood, dried, bulk	uni	4.25 –	....
Bone, raw, 3 and 50, ground	ton	27.00 –	30.00
Fish scrap, dom., dried, wks.	uni	4.00 –	....
Nitrate of soda, bags	100 lb.	2.60 –	2.65
Tankage, high grade, f.o.b. Chicago	unit	3.25 –	3.50
Phosphate rock, f.o.b. mines, Florida pebble, 68-72%	ton	$4.00 –	$4.50
Tennessee, 78-80%	ton	8.00 –	8.25
Potassium muriate, 80%, bags	ton	34.55 –	....
Potassium sulphate, bags basis 90%	ton	43.67 –	....
Double manure salt	ton	25.72 —	....
Kainit	ton	7.22 —	....

Crude Rubber

Para—Upriver fine	lb.	$0.26½ –	....
Upriver coarse	lb.	.23 –	....
Upriver caucho ball	lb.	.25 –	....
Plantation—First latex crepe	lb.	.27½ –	.27¾
Ribbed smoked sheets	lb.	.27½ –	.27¾
Brown crepe, thin, clean	lb.	.25½ –	....
Amber crepe No. 1	lb.	.26½ –	.26¾

Gums

Copal, Congo, amber, bags	lb.	$0.12 –	$0.13
East Indian, bold, bags	lb.	.23 –	.23½
Manila, pale, bags	lb.	.20 –	.20½
Pontinak, No. 1 bags	lb.	.20 –	.20½
Damar, Batavia, cases	lb.	.30 –	.30½
Singapore, No. 1, cases	lb.	.34½ –	.35
Singapore, No. 2, cases	lb.	.24 –	.25
Kauri, No. 1, cases	lb.	.65 –	.67
Ordinary chips, cases	lb.	.18 –	.20
Manjak, Barbados, bags	lb.	.09 –	.09½

Shellac

Shellac, orange fine, bags	lb.	$0.68 –	....
Orange superfine, bags	lb.	.70 –	.71
A. C. garnet, bags	lb.	nominal	
Bleached, bonedry	lb.	.76 –	.78
Bleached, fresh	lb.	.66 –	....
T. N., bags	lb.	.64 –	.66

Miscellaneous Materials

Asbestos, crude No. 1, f.o.b., Quebec	sh. ton	$500.00 –	....
Asbestos, shingle, f.o.b., Quebec	sh. ton	$65.00 –	$85.00
Asbestos, cement, f.o.b., Quebec	sh. ton	20.00 –	25.00
Barytes, grd., white, f.o.b. mills, bbl	net ton	16.00 –	20.00
Barytes, grd., off-color, f.o.b. mills bulk	net ton	13.00 –	15.00
Barytes, floated, f.o.b. St. Louis, bbl	net ton	28.00 –	....
Barytes, crude f.o.b. mines, bulk	net ton	10.00 –	11.00
Casein, bbl., tech	lb.	.22½ –	.25
China clay (kaolin) crude, f.o.b. Ga.	net ton	7.00 –	9.00
Washed, f.o.b. Ga.	net ton	8.00 –	9.00
Powd., f.o.b. Ga.	net ton	14.00 –	20.00
Crude f.o.b. Va.	net ton	8.00 –	12.00
Ground, f.o.b. Va.	net ton	14.00 –	20.00
Imp., lump, bulk	net ton	15.00 –	20.00
Imp., powd.	net ton	45.00 –	50.00
Feldspar, No. 1 pottery	long ton	6.00 –	7.00
No. 2 pottery	long ton	4.00 –	5.50
No. 1 soap	long ton	7.00 –	7.50
No. 1 Canadian, f.o.b. mill	long ton	20.00 –	22.00
Graphite, Ceylon, lump, first quality, bbl	lb.	.06½ –	....
Ceylon, chip, bbl	lb.	.05½ –	....
High grade amorphous crude	ton	15.00 –	35.00
Gum arabic, amber, sorts, bags	lb.	.15 –	.16
Gum tragacanth, sorts, bags	lb.	.50 –	.60
No. 1, bags	lb.	1.50 –	1.60
Kieselguhr, f.o.b. Cal.	ton	40.00 –	42.00
F.o.b. N. Y.	ton	50.00 –	55.00
Magnesite, crude, f.o.b. Cal.	ton	14.00 –	15.00
Pumice stone, imp., casks	lb.	.03 –	.05½
Dom., lump, bbl	lb.	.05 –	.05½
Dom., ground, bbl	lb.	.06 –	.07
Silica, glass sand, f.o.b. Ind.	ton	2.00 –	2.50
Silica, sand blast, f.o.b. Ind.	ton	2.50	5.00
Silica, amorphous, 250-mesh, f.o.b. Ill.	ton	17.00 –	17.50
Silica, bldg. sand, f.o.b. Pa.	ton	2.00 –	2.75
Soapstone, coarse, f.o.b. Vt., bags	ton	7.00 –	8.00
Talc, 200 mesh, f.o.b., Vt., bags	ton	6.50 –	9.00
Talc, 200 mesh, f.o.b. Ga., bags	ton	7.00 –	9.00
Talc, 200 mesh, f.o.b. Los Angeles, bags	ton	16.00 –	20.00

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$3.50 –	......
Corning	bbl.	2.00 –	......
Cabell	bbl.	2.16 –	......
Somerset	bbl.	1.95 –	......
Illinois	bbl.	2.07 –	......
Indiana	bbl.	2.08 –	......
Kansas and Oklahoma, 28 deg.	bbl.	1.40 –	......
California, 35 deg. and up	bbl.	1.04 –	......

Gasoline, Etc.

Motor gasoline, steel bbls	gal.	$0.22½ –	......
Naphtha, V. M. & P. deod, steel bbls	gal	.21½ –	......
Kerosene, ref. tank wagon	gal.	.14 –	......
Bulk, W. W. export	gal.	.07 –	......
Lubricating oils:			
Cylinder, Penn., dark	gal.	.27 –	.30
Bloomless, 30@31 grav.	gal.	.20 –	.22
Paraffin, pale	gal.	.24 –	.25
Spindle, 200, pale	gal.	.25 –	.26
Petrolatum, amber, bbls	lb.	.05 –	.05½
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	ton	$45–50
Chrome brick, f.o.b. Eastern shipping points	ton	50–52
Chrome cement, 40-50% Cr_2O_3	ton	23–27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	40–46
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	36–41
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65–68
9-in. arches, wedges and keys	ton	80–85
Scraps and splits	ton	85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	48–50
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	48–50
F.o.b. Mt. Union, Pa.	1,000	42–44
Silicon carbide refract. brick, 9-in.	1,000	1,100.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N. Y.	ton	$200.00 –	$225.00
Ferrochromium, per lb. of Cr, 6-8% C	lb.	.11½	.11¾
4-6% C	lb.	.12 –	.13
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	120.00 –	....
Spiegeleisen, 19-21% Mn.	gr. ton	40.00 –	....
Ferromolybdenum, 50-60% Mo, per lb. Mo	lb.	2.00 –	2.50
Ferrosilicon, 10-15%	gr. ton	48.00 –	50.00
50%	gr. ton	95.00 –	....
75%	gr. ton	150.00 –	160.00

Ferrotungsten, 70-80%, per lb. of W	lb.	$0.90 –	$0.95
Ferro-uranium, 35-50% of U. per lb. of U	lb.	6.00 –	....
Ferrovanadium, 30-40%, per lb. of V	lb.	3.50 –	3.75

Ores and Semi-finished Products

Bauxite, dom. crushed, dried, f.o.b. shipping points	ton	$6.00 –	$9.00
Chrome ore Calif. concentrates, 50% min. Cr_2O_3	ton	22.00 –	23.00
C.i.f. Atlantic seaboard	ton	20.50 –	24.00
Coke, fdry., f.o.b. ovens	ton	7.00 –	7.50
Coke, furnace, f.o.b. ovens	ton	6.00 –	6.50
Fluorspar, gravel, f.o.b. mines' Illinois	ton	20.00 –	21.50
Ilmenite, 52% TiO_2	lb.	.01¼–	.01½
Manganese ore, 50% Mn, c.i.f. Atlantic seaport	unit	.33 –	....
Manganese ore, chemical (MnO_2)	ton	75.00 –	80.00
Molybdenite, 85% MoS_2, per lb. MoS_2, N. Y.	lb.	.65 –	.70
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 –	.08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½–	.12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.11½–	.12
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12	
Rutile, 95% TiO_2	lb.	.12 –	....
Tungsten, scheelite, 60% WO_3 and over, per unit WO_3	unit	8.50 –	8.75
Tungsten, wolframite, 60% WO_3 and over, per unit WO_3	unit	8.00 –	8.25
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 –	3.75
Uranium oxide, 96% per lb. U_3O_8	lb	2.25 –	2.50
Vanadium pentoxide, 99%	lb.	12.00 –	14.00
Vanadium ore, per lb. V_2O_5	lb.	1.00 –	....
Zircon, washed, iron free, f.o.b. Pablo, Fla.	lb.	.04½–	.13

Non-Ferrous Materials

	Cents per Lb.
Copper, electrolytic	16¼-16½
Aluminum, 98 to 99%	25–27
Antimony, wholesale, Chinese and Japanese	7½– 8¼
Nickel, virgin metal	28–30
Nickel, ingot and shot	30–
Monel metal, shot and blocks	32.00
Monel metal, ingots	38.00
Monel metal, sheet bars	45.00
Tin, 5-ton lots, Straits	44.52½
Lead, New York, spot	7.25
Lead, E. St. Louis, spot	7.15
Zinc, spot, New York	7.27
Zinc, spot, E. St. Louis	6.92

Other Metals

Silver (commercial)	oz.	$0.66⅞
Cadmium	lb.	1.00
Bismuth (500 lb. lots)	lb.	2.55
Cobalt	lb.	2.65@2.85
Magnesium, ingots, 99%	lb.	1.25–.....
Platinum	oz.	116.00
Iridium	oz.	260.00@275.00
Palladium	oz.	81.00
Mercury	75 lb.	67.00

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	25.50
Copper bottoms	30.75
Copper rods	25 25
High brass wire	19 37½
High brass rods	17.00
Low brass wire	21 10
Low brass rods	22 00
Brazed brass tubing	24 25
Brazed bronze tubing	29 00
Seamless copper tubing	25.25
Seamless high brass tubing	23.50

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

Copper, heavy and crucible	11 60@11 80
Copper, heavy and wire	11.50@11 60
Copper, light and bottoms	10.00@10 10
Lead, heavy	5.75@ 6 00
Lead, tea	3.50@ 3 75
Brass, heavy	6.50@ 6 75
Brass, light	5.75@ 6 00
No. 1 yellow brass turnings	6.75@ .700
Zinc	3.75@ 4.25

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$3 29	$3 14
Soft steel bars	3.19	3.04
Soft steel bar shapes	3.19	3.04
Soft steel bands	3.29	3.19
Plates, ¼ to 1 in. thick	3.29	3.14

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Arkansas

BLYTHEVILLE—The Waggoner-Gage Corp. has plans under way for the erection of a new cottonseed oil mill on local site to cost about $250,000, with machinery. The plant will consist of a number of buildings and power house.

California

MONOLITH—The Monolith Portland Cement Co. is perfecting plans for enlargements in its plant for considerable increase in capacity. It is purposed to increase the output from 3,000 to 6,000 bbl. per day by the close of the year. The initial machinery installation will be designed to advance the capacity to 4,500 bbl. daily.

LONG BEACH—The Seaboard Refining Co., recently organized, is perfecting plans for the construction of a new oil-refining plant on local site with capacity of about 6,000 bbl. daily. It will consist of a number of buildings and is estimated to cost in excess of $750,000, with machinery. The Keck Syndicate, J. L. Keck, president, is interested in the new company.

SAN BERNARDINO—The Cajon Lime Products Co., lately formed, has plans in progress for the development of lime deposits and the construction of a plant on property acquired at Camp Cajon, near San Bernardino. The initial works will cost about $200,000, including machinery. W. F. Warner, Riverside, Calif., heads the new company.

SAN FRANCISCO—The Bass-Hueter Paint Co., 816 Mission St., has awarded a contract to Barrett & Hilp, 918 Harrison St., for the erection of a 4-story plant at Kansas and 24th Sts., estimated to cost $55,000. A. A. Pyle, 918 Harrison St., is architect.

COALINGA—The California Asbestos Co. has work in progress on a new mill to cost approximately $60,000, including equipment. Machinery will be installed at an early date.

LOS ANGELES—The Pan-American Petroleum & Transport Co. will build a large storage and distributing plant in connection with its new refinery in the San Pedro district, to provide for a capacity of over 2,000,000 bbl. The entire plant will cost close to $5,000,000. E. L. Doheny is president.

Georgia

FORT WENTWORTH—The Savannah Sugar Refining Co., Savannah, is perfecting plans for the rebuilding of the portion of its local plant recently destroyed by fire, with loss approximating $50,000.

Illinois

CHICAGO—The Dryden Rubber Co., 1014 South Kildare Ave., manufacturer of molded and mechanical rubber products, has awarded a general contract to J. H. Clancy & Sons, 189 West Madison St., for the erection of a 1-story plant addition, 69x178 ft., estimated to cost $50,000.

CHICAGO—The Commonwealth Varnish Co., 4125 Parker Ave., has commenced the erection of a 1-story building, to be equipped as a laboratory.

OTTAWA—The National Plate Glass Co., General Motors Bldg., Detroit, Mich., has plans in progress for the erection of its proposed new plant addition, consisting of a number of 1-story buildings, and will call for bids in the near future. The plant will cost in excess of $5,000,000, with machinery. John Berg is local manager.

CHICAGO—Brenner, Monley & Morris, Inc., care of Fox & Fox, 38 South Dearborn St., architects, is taking bids on a general contract for the erection of a 1-story copper rod mill on Kedzie St., 100x300 ft., estimated to cost $300,000, with machinery. William A. Wood, 50 Church St., New York, is consulting engineer.

Indiana

HAMMOND—The Martin Oil & Refining Co., operating at Osborne, near Hammond, plans for the rebuilding of the portion of its plant, destroyed by fire, April 27, with loss estimated at $200,000, including machinery.

MARION—The Upland Flint Glass Works, Inc., manufarturer of hollowware, is perfecting plans for the rebuilding of its local plant, recently destroyed by fire, with loss estimated at $100,000, with machinery. The reconstruction will cost approximately a like amount.

ANDERSON—The Inter-Continental Tire & Rubber Co., recently organized, has acquired the local plant of the Majestic Tire & Rubber Co., at Cruse and Daly Sts., and will make improvements and extensions in the mill to provide for an initial output of 600 tires per day. It is purposed to commence operations at an early date. J. D. Wiggins, president and general manager of the International Rubber Co. of America, Inc., Anderson, heads the new organization.

Iowa

DUBUQUE—The Ott Rubber Co., Bank & Insurance Bldg., has tentative plans under consideration for the erection of a new 1-story plant, with power house, estimated to cost $80,000. J. L. Ott is president.

Maryland

BALTIMORE—The United States Industrial Alcohol Co., Curtis Bay, has plans in progress for the construction of additions to its plant to cost about $750,000, including machinery. The work will consist of a large reclaiming plant to be used in connection with the manufacture of potash, with adjoining mill for the production of fertilizers. A new factory will also be constructed for the production of chemicals.

BALTIMORE—The United States Industrial Chemical Co. has filed plans for the erection of a 1-story addition, 50x250 ft., at its Fairfield works, to cost about $15,000, exclusive of equipment.

BALTIMORE—The Wyatt Rubber & Chemical Co., 730 North Eutaw St., recently organized, is planning for the installation of equipment in a local building. The company will specialize in the production of rubber cements and kindred products. Charles M. Wyatt is president.

Massachusetts

EAST BOSTON—The Acme White Lead & Color Works, Inc., 266 Border St., has filed plans for the erection of a 1-story plant addition, to replace a portion of its works recently destroyed by fire.

Michigan

HOWLANDSBURG—The El-Mora-Lee Paper Co., Kalamazoo, Mich., recently organized with a capital of $600,000, to manufacture kraft and kindred paper products, has tentative plans under consideration for the erection of a new 4-story mill at Howlandsburg, with power house and other mechanical structures, estimated to cost $300,000, with machinery. Irving Hopper is one of the heads of the company, which has established offices at 839 Lake Blvd.

ESCANABA—The Universal Magnesite Products Co., has commenced the erection of a new 1-story building, 40x140 ft., for increased production.

Missouri

ELSBERRY—The Crystal Carbonate Lime Co., Louisiana, Mo., will immediately commence rebuilding the portion of its local plant, recently destroyed by fire, and will install new crushing, mixing and other machinery for the production of commercial fluxing stone.

KANSAS CITY—The American Paper Mfg. Co. will break ground for the construction of a new mill on property recently acquired on Armour Rd., North Kansas City, and will install machinery for an initial daily output of about 30 tons. The plans will cost about $85,000.

New Jersey

TRENTON—The Elite Pottery Co., Enterprise Ave., manufacturer of sanitary earthenware, has awarded a general contract to Harry A. Fasker, Trenton, for the erection of a 1-story addition, to cost about $20,000, exclusive of equipment.

SOUTH MILLVILLE—The Whitall-Tatum Co., manufacturer of druggists' glassware, vials, etc., has preliminary plans under consideration for the rebuilding of the portion of its local plant destroyed by fire, May 3, with loss estimated in excess of $400,000, including machinery. Four furnace buildings were seriously damaged, including Plants, 9, 10, 11 and 12.

TRENTON—The Jointless Fire Brick Co., 1130 Clay St., Chicago, Ill., has awarded a contract to James H. Morris & Co., South Broad St., for the erection of the first unit of its new firebrick and refractory plant on New York Ave., Trenton. It will be 1-story, estimated to cost about $40,000, with equipment.

JERSEY CITY—Fire, May 1, destroyed a portion of the plant of the R. T. Claremont Chemical Co., 54 Montgomery St., with loss estimated at about $40,000, including equipment. It is planned to rebuild.

New York

ROCHESTER—Fire, April 27, destroyed a portion of the chemical plant at the works of the Eastman Kodak Co., Kodak Park. An official estimate of loss has not been made. It is planned to rebuild. Frank W. Lovejoy is general manager.

Ohio

BELLAIRE—The Bellaire Enamel Co., 18th St., has plans under way for the erection of a new 2-story addition to its plant to cost about $45,000. J. V. Anderson, Egerter Bldg., Wheeling, W. Va., is architect.

TORONTO—The Board of Trustees will soon commence the installation of a new filtration plant at the municipal waterworks, estimated to cost $125,000.

Oklahoma

TULSA—The Oklahoma Steel Castings Co. has plans nearing completion for enlargements in its plant to double the present output, making a total capacity of close to 30 tons per day. E. H. Cornelius is president.

ADA — The Athens Glass Works, Inc., Morgantown, W. Va., has tentative plans under consideration for the erection of a new branch plant on local site, estimated to cost more than $60,000, with equipment.

TULSA—The Spanish-American Tile Co., recently formed with a capital of $50,000, is perfecting plans for the erection of a local plant for the manufacture of floor and wall tile. F. W. and C. J. Gallagher, Tulsa, are heads.

Pennsylvania

PHILADELPHIA—George D. Feldt & Co., 244 North 5th St., manufacturers of chemical products, have plans in preparation for the erection of a new plant at 5th and Buttonwood Sts. Clarence E. Wunder, 1415 Locust St., is architect.

SCOTTDALE—The United States Cast Iron Pipe & Foundry Co. is considering the rebuilding of the portion of its local plant destroyed by fire, May 2, with loss estimated at $100,000, including equipment. Headquarters are at 71 Broadway, New York.

CLAIRTON—The Pittsburgh Soda Products Co. is arranging for an increase in capital from $100,000 to $200,000, a portion of the proceeds to be utilized for plant expansion. J. S. Nichols is secretary.

ARNOLD—The American Window Glass Co., Farmers' Bank Bldg., Pittsburgh, has perfected plans for the rebuilding of the portion of its local plant recently destroyed by fire with loss estimated at $75,000.

South Carolina

MARION—The Board of Education will install a chemistry and physics laboratory in the proposed new local high school, for which plans will be prepared at an early date.

Tennessee

CHATTANOOGA — The Crane Enamelware Co. has commenced the erection of a new plant unit to cost in excess of $150,000, including equipment, and plans to have the initial buildings ready for service at an early date. The company is a subsidiary of the Crane Co., Chicago, Ill.

Texas

STAMFORD—The Rule-Jayton Cotton Oil Co. has acquired the local cottonseed oil mill of the Stamford Oil Co., and plans for additions in the plant for extensive increase in capacity. The crushing output will be increased with additional machinery for a gross of 100 tons per day. C. M. Francis is general manager.

FORT WORTH—A new plant for the manufacture of creosote for wood-treating service is being planned by the National Lumber & Creosoting Co., Texarkana, Tex., in connection with a new plant on local site recently acquired. The entire plant is estimated to cost $200,000. John T. Logan is president.

SWEETWATER—The City Commission has authorized the installation of a new filtration plant at the municipal waterworks to cost about $37,000. Work will be placed under way at an early date.

Virginia

STAUNTON—The Virginia-Carolina Chemical Co., Richmond, is planning for extensions and improvements in its local plant, devoted to the manufacture of fertilizer products, estimated to cost $30,000.

HOPEWELL—The Hopewell China Co. is considering preliminary plans for the rebuilding of its pottery, destroyed by fire, May 1, with loss estimated at $100,000, including machinery.

SOUTH RICHMOND — The Economy Concrete Co., recently organized with a capital of $100,000, will commence the immediate erection of a new 1-story plant, 100x160 ft. Crushing, grinding, mixing and other machinery will be installed. J. Scott Parrish is president.

Washington

SEATTLE—The Superior Portland Cement Co., Seaboard Bldg., has plans for extensions in its plant at Concrete, Wash., to include the construction of a hydro-electric power plant on Jackman Creek, estimated to cost $175,000.

New Companies

CHIN-CHIN CHEMICAL CO., 8 South Dearborn St., Chicago, Ill.; chemicals and chemical byproducts; $250,000. Incorporators: John A. Combs, Percy Kleis and William A. Hamilton.

HERBST CHEMICAL CORP., New York, N. Y.; chemicals and chemical byproducts; $20,000. Incorporators: M. and S. B. Herbst. Representative: Hyman Bushel, 1482 Broadway.

STAR CHEMICAL CO., Philadelphia, Pa.; chemicals and chemical byproducts; $75,000. Incorporators: Arthur G. McGregor, Omar G. Jones and T. L. Powell. Representative: Delaware Registration Trust Co., 900 Market St., Wilmington, Del.

SAGINAW RUBBER CO., Saginaw, Mich., rubber products; $10,000. Incorporators; Herbert A. Otto, Robert T. Holland and Seward G. Andrews, 801 Genesee Ave. The last noted is representative.

DIVIDE RIDGE OIL CO., San Francisco, Calif.; petroleum products; $500,000. Incorporators: Charles H. Holbrook, Jr., William M. Madden and Herman J. Widman. Representative: William M. Madden, Crocker Bldg.

QUAKER HILL PAPER CO., New Haven, Conn.; paper and pulp products; $50,000. Incorporators: A. W. Chambers, H. H. Hitchcock and George P. Smith, 185 Church St. The last noted is representative.

KERN PRODUCTS CO., Scott and Railroad Sts., Rahway, N. J., organized; chemicals and chemical byproducts. The company is headed by Edgar and Samuel Genstein, 412 West 129th St., New York.

GENERAL GLASS CO., Wilmington, Del.; glass products; $1,000,000. Representative: The Colonial Charter Co., Ford Bldg., Wilmington.

SHIRLEY OIL CO., INC., Shirley, Ill.; refined oils; $75,000. Incorporators: Charles W. Hutchinson, John P. Walters and R. T. Lain, all of Shirley.

BRAENDER RUBBER & TIRE CO., INC., Wallington, N. J.; rubber products; $265,000. Incorporators: Benjamin F. Teitelbaum, R. E. Donahue and David Z. Jeselsohn, all of Wallington.

ATLAS PETROLEUM CORP., San Antonio, Tex.; petroleum products; $50,000. Incorporators: William and T. R. Levin, and J. E. Mason, all of San Antonio.

AJAX CHEMICAL CO., Wilmington, Del.; chemicals and chemical byproducts; $2,000,000. Representative: Corporation Trust Co. of America, du Pont Bldg., Wilmington.

DEMATTIA INDUSTRIAL ALCOHOLA, INC., New York, N. Y.; industrial alcohol and kindred products; $25,000. Incorporators: M. Demattia, G. H. Phillips and R. M. Walters. Representative: Harold Lee, 36 West 44th St., New York.

DE PREES LABORATORIES, INC., Holland, Mich.; chemical products; $26,000. Incorporators: R. G. Wasey, W. A. and A. J. Diekema, Holland. The last noted is representative.

BAY FERTILIZER CO., Tampa Bay, Fla.; fertilizer products; $100,000. Incorporators: S. W. Allen and C. Edmond Worth, both of Tampa Bay.

TITUS CHEMICAL CO., 171 Columbia Ave., North Bergen, N. J., organized; chemicals and chemical byproducts. Thomas A. Titus heads the company.

ATLAS PAINT & VARNISH CO., INC., 1923 Blue Island Ave., Chicago, Ill.; paints, oils, varnishes, etc.; $35,000. Incorporators: John J. Barcal, A. and Frank C. Barta.

RODGERS CHEMICAL CO., Pittsburgh, Pa., organized; chemicals and chemical byproducts. Frederick G. Rodgers and J. M. Wellings head the company. Representative: Wright & Rundle, Frick Bldg., Pittsburgh.

BESSE SANITARY POWDER MFG. CO., Tulsa, Okla.; $5,000, nominal; washing powders, chemical specialties, etc. Incorporators: E. Besse, E. Gray and L. W. Ray, Avant, Okla.

FRANK HALVERSEN CO., Jersey City, N. J.; paper and pulp products; $100,000. Incorporators: Frank Halversen, Allen E. Hosking and Frank F. Albietz, 76 Montgomery St., Jersey City. The last noted is representative.

AMERICAN CYANAMID CO., Wilmington, Del.; calcium carbide and affiliated products; $100,000. Representative: Corporation Trust Co. of America, du Pont Bldg., Wilmington.

WILMINGTON HIDE & TALLOW CO., Wilmington, Ill.; greases, oils, etc.; $25,000. Incorporators: Aaron Cohen and Samuel G. Barnhard, both of Wilmington.

SUPERBS RUBBER CO. OF PENNSYLVANIA, INC., Scottdale, Pa.; rubber products; $100,000. Incorporators: W. H. Grant, James P. Strickler and Charles A. Miller, Scottdale. Representative: Corporation Service Co., Equitable Bldg., Wilmington, Del.

HOWIE GLASS CO., INC., 4260 Grand River Ave., Detroit, Mich.; glass products; $8,000, nominal. Incorporators: Joseph L. Hare, Thomas J. Blake and William Howie, 1640 Church St., Detroit. The last noted is representative.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

ARTIFICIAL LEATHER for upholstery, motor car and furniture trades. Johannesburg, South Africa. Manufacturers' agency.—6241.

CARBONATE OF POTASH of different grades, in quantity of 20 to 40 tons at a time. Antwerp, Belgium. Purchase.—6257.

CHEMICALS, and surgical supplies—Egypt. Manufacturers' agency.—6258.

ROSIN, caustic soda, iron and steel products, tin plate, portland cement, paper, and leather. Rio de Janeiro, Brazil. Agency.—6259.

ZINC DUST for Crowe and Merrill metallurgical process. Johannesburg, South Africa. Agency.—6264.

EQUIPMENT for the manufacture of carbon dioxide and cylinders for storing and marketing the gas. Guaymas, Mexico. Purchase.—6267.

OIL CAKES, meat scraps, meat cakes, sulphate of ammonia, tankage, etc. Antwerp, Belgium. Purchase.—6280.

TANNING MACHINERY, substantial and modern. Provadia, Bulgaria. Purchase.—6316.

CASEIN, cork stoppers and mineral colors. Prague, Czechoslovakia. Purchase.—6320.

MACHINERY for the extraction of turpentine and byproducts, and implements and supplies for the extraction of the gum from the tree. Guadalajara, Mexico. Purchase.—6321.